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Farm Chemicals

How to Keep the Farmer's Trust 18

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VOL. 121 NO. 9

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Farm Chemicals

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PIONEER JOURNAL OF THE INDUSTRY

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IN THIS ISSUE

▶ Installation of supplementary second-stage cyclone type collectors has helped the Smith Agricultural Chemical Co. of Columbus, Ohio in its effort to keep dust out of the air . . . page 15.

▶ John Mark says that because there have been few cases of injury among those who work with pesticides in fertilizer plants, there is sometimes a tendency to be careless in handling the mixture materials. He outlines safety procedures on page 20.

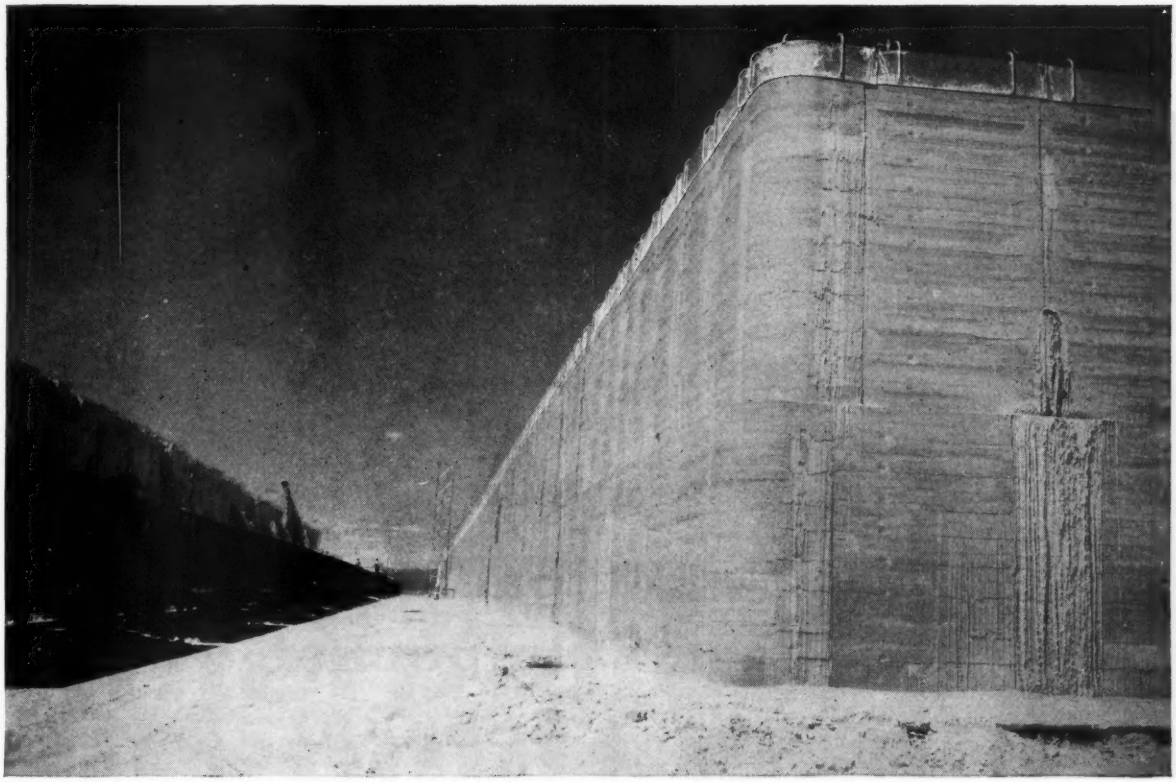
▶ A well-known agricultural economist discusses four approaches to estimating future fertilizer use, and then makes his own estimates for 1965 . . . page 25.

▶ Richard F. Dudley, a USDA agricultural engineer whose home base is the Agricultural Research Center in Beltsville, Md., travels around the country with his experimental grassland drill—at the request of state experiment stations. We talked with him at Purdue last month about band fertilizing . . . page 30.

COVER PICTURE

G. W. Walker, Purdue extension agronomist, was talking to a group of agronomists about the effects of chlorides on corn growth and yield. We decided that he exemplified the role of research and education in carrying knowledge of farm chemicals to the farmer.

Photo by Lee Wilcox



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...a continuing company policy established years ago

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The government is stockpiling strategic materials for its long range defense program. Thus, it serves the citizenry. The producer of a raw material who as a company policy stockpiles also serves . . . serves its customers who in turn serve others by being able to count on a supply of the raw material in quantity.

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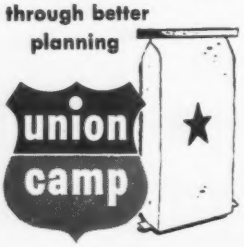

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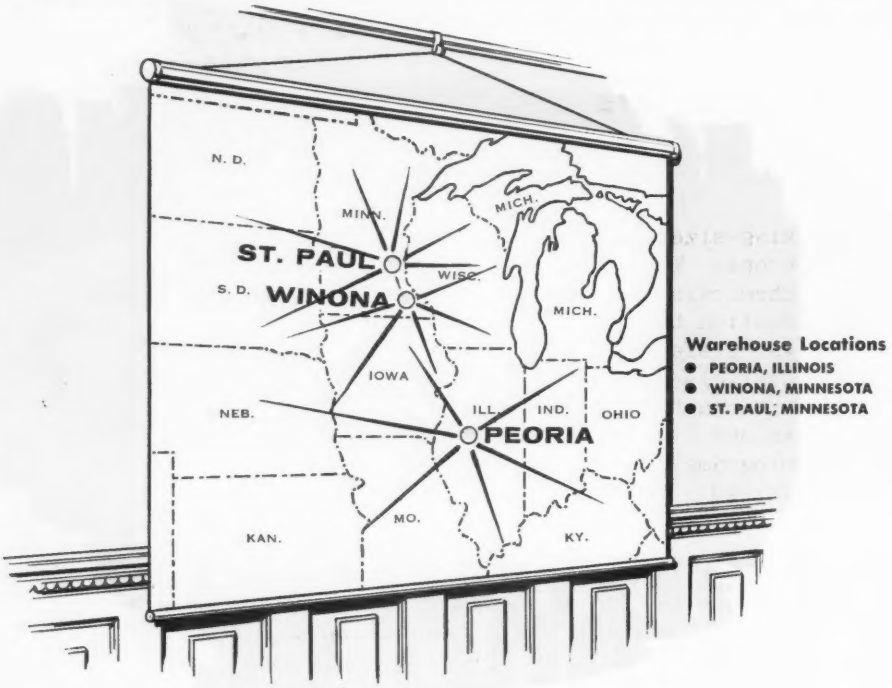

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VIEWING WASHINGTON

with Farm Chemicals
Washington Bureau

on agriculture

One king-sized step closer to stringent unit controls on farm crops. That's the over-riding significance to the farm chemicals industry of the new record total farm crop production being registered this year. Government officials--who prefer to steer clear of this so-called ultimate of crop controls--now see it as almost certain in view of obvious "runaway" farm production.

As one high-ranking official put it: The present control programs, based on restricting allotments, have completely failed. There's little likelihood that lower supports and increased allotments (as recommended by Secretary Benson) could check the trend in increased production. What's left apparently is unit controls--on bushels, pounds and bales. Unit controls may put a serious crimp in fertilizer sales, according to experts. Farmers would be told how many bushels, pounds or bales they could harvest from a given amount of acres. This would remove much of the current incentive to increase yields per acre by using recommended rates of fertilizer.

The unit control plan may be closer to reality than most observers think. It has already been tried, with little success, on the 1939 tobacco crops. But many prominent economists have said that effective crop control can only be obtained through this approach. The current farm production is expected to stimulate new discussion of the plan in the next Congress. If 1959 production matches that of 1958--the big push is likely to develop for such controls to head-off an agricultural economic collapse brought on by severe market surpluses.

How does the Agriculture Department feel about them? We've interviewed some of the top brass and found that USDA has not closed the door to quantity controls--and may in the future recommend them. But USDA first wants to try to control production through more freedom for farmers. If that fails, and nothing else is done "to reduce or eliminate the need for controls"--the only other course may be a straight-jacket on bushels.

USDA says: "The shift from acreage to bushel allotments by all means is not a dead subject. We can expect considerable discussion on this subject as long as we do have large surpluses . . . ."

What raises the issue so pointedly is not that total field crop production in 1958 will be bigger than the old record established in 1948 and matched in 1956 and 1957--but that crop yields keep breaking records. No less than 10 major crops will register new highs in per-acre yields. In many cases the new records follow records established just 1, 2 or 3 years ago. A lion's share of the credit for the tre-

VIEWING WASHINGTON

agriculture continued

mendous strides upward in crop production goes, naturally enough, to fertilizer. Crop control officials shudder considering that fertilizer use is far below optimum levels. This is the list: Cotton, 1958 yield looks like 466 pounds per acre, compared with the 10-year average of 317 pounds. Corn, 47.6 bushels, compared with 38.8. Wheat, 26.5 bushels compared with 17.7. Oats, 42.1 bushels, compared with 34.3. Rye, 18.3 bushels, compared with 12.8. Rice, 3,353 hundredweight, compared with 2,465. Dry beans, 1,213 hundredweight, compared with 1,088. Soybeans, 22.9 bushels, compared with 20.3. Fall potatoes, 191 hundred-weight in 1958, compared with the 10-year average of 167. Grain sorghum, peanuts and some other crops also are at record yield levels or close. This is an impressive list. Its significance is obvious.

Higher fees for the establishment of tolerances under the Miller Pesticide Amendment--made effective August 7 by the Food and Drug Administration--average 2½ times those now paid by pesticide manufacturers.

A deposit of $3,750 must now accompany each application for two or more tolerances, compared with the $2,500 fee in effect since 1954. In addition, there is now a $250 deposit required for each raw agricultural commodity above the first 14 commodities in the application for tolerances. The old fee was $100.

Total production of pesticides and other organic farm chemicals in 1957 amounted to 512 million pounds--about 10 per cent less than the 570 million pounds reported for 1956. On the other hand, sales increased 8 per cent: 433 million pounds valued at $178 million in 1957, up from 399 million pounds valued at $173 million in 1956. The figures were compiled by the U.S. Tariff Commission.

Production of cyclic pesticides and other cyclic chemicals amounted to about 407 million pounds in 1957, compared with 474 million pounds in 1956, a decrease of 14 per cent. Sales were 340 million pounds valued at $132 million in 1957, compared with 343 million pounds valued at $135 million in 1956. 1957 DDT production was 125 million pounds. Production of acyclic pesticides and other acyclic organic farm chemicals amounted to 104 million pounds in 1957, compared with the 96 million reported for 1956. Sales were 94 million pounds valued at $46 million in 1957, and 57 million pounds valued at $38 million in 1956.

The U.S. has shipped 33 million tons of DDT to help fight malaria throughout the world during the first 6 months of 1958. The DDT has been bought from U.S. industry with funds from the International Cooperation Administration. It's part of a world-wide campaign to wipe out malaria, and is supported by 60 nations.

Arcadian® News

Volume 3 | For Manufacturers of Mixed Fertilizers | Number 9

Hopewell Plant 30 Years Young!

Called "one of the greatest chemical achievements in America!"

Looking back over the years to 1928, Nitrogen Division, Allied Chemical, can take pardonable pride in its Hopewell, Virginia, plant. For Hopewell started BIG (biggest nitrogen plant in the country) and is probably the largest in the world today! In addition, this plant helps Nitrogen Division offer fertilizer producers *the most complete line* of nitrogen products (backed by the *most* nitrogen experience) in the industry!

First Units Built in 1928

In a real sense, the Hopewell plant was the culmination of all the ammonia research and experimentation begun at Laurel Hill, Long Island, N. Y. by the group that later formed Nitrogen Division . . . continued at Sheffield, Alabama . . . and carried into commercial production by Allied Chemical at Syracuse, New York. By 1928 the first units at Hopewell were completed. From the start, plant production kept increasing, until—by the end of 1930—it approached 200,000 tons of nitrogen a year! At the time, this was the largest output in the world outside Germany!

Key Nitrogen Unit in National Defense

For the first time, with the construction of the Hopewell plant, the United States became independent of foreign supply of nitrogen. No longer would there be anxious moments over availability of nitrogen materials for fertilizers in peace, or munitions in war. In 1941, Nitrogen Division expanded facilities at Hopewell, making it the most important nitrogen unit in the nation's defense program.

Hopewell Tomorrow

Termed, in its early days, "one of the greatest chemical achievements in America", the Hopewell plant has fulfilled its promise by constant growth and great flexibility in meeting the changing demands of the business it serves. It will continue its role as Nitrogen Division headquarters for nitrogen research and development.

Working closely with the technical staffs of sister plants at South Point, Ohio, and Omaha, Nebraska, Hopewell will maintain a continuing search for more and better nitrogen solutions for fertilizer production. The pay off is *yours*—in *more* business . . . *bigger* profits! Standardize on Nitrogen Division!

Arcadian News for Fertilizer Manufacturers . . . . . from NITROGEN DIVISION

Allied Chemical Research Created and Developed Nitrogen Solutions

Use of superphosphate as an absorbent for ammonia goes back as far as 1873. However, this process was not to attain any commercial importance until development of the synthetic ammonia process many years later.

In 1921, at Syracuse, New York, Allied Chemical became the first to produce synthetic ammonia commercially in the United States. The fertilizer industry was quick to see and capitalize on the advantages offered by ammoniation of superphosphate. Cost-wise, the formulation of mixed fertilizer with nitrogen, using low-cost ammonia, was very attractive. What made it even more attractive was the fact that superphosphate, the other component of the reaction, was already the mainstay of the mixed fertilizer industry. In fact, use of nitrogen in the concentrated form of ammonia, not only simplified formulation but actually improved the physical condition of the superphosphate and reduced curing time.

However, the proportion of nitrogen that could be put into a mixture in the form of ammonia proved to be limited to the absorption capacity of the superphosphate, and by the tendency of overly alkalized phosphate to revert to insoluble form.

Development of Solutions

In February, 1929, an Allied Chemical researcher reasoned that he could put additional quantities of nitrogen into superphosphate by making use of the solvent power of ammonia on other nitrogen compounds. Experiments soon proved him right—and Allied Chemical scored another "first": the ammoniation of superphosphate with ammoniacal salt solutions.

Test experience with this new method showed that one of the most important salts that could be used in ammoniation solutions is ammonium nitrate. Indeed, this combination of nitrate nitrogen and ammonia nitrogen proved to be desirable from an agronomic viewpoint for the following reasons: 1) Ammonium nitrate is extremely soluble in ammonia, providing solutions of high overall nitrogent content. 2) Being a commercial chemical in great supply, ammonium nitrate is economical. 3) With the proper blending of ammonia, ammonium nitrate and water, it is possible to obtain solutions that permit ammoniation of many types of mixed fertilizers with safety, convenience and adaptability.

First Commercial Use

In October, 1929, Allied Chemical supplied a solution of ammonium nitrate in ammonia to ammoniate approximately 100 tons of superphosphate in a plant test at Norfolk, Virginia. This was the first commercial ammoniation of fertilizer with an ammoniacal ammonium nitrate solution.

The solution used at Norfolk was the forerunner of Allied Chemical's NITRANA type solutions, introduced to the fertilizer industry in 1932. On April 13, 1937, Allied Chemical was granted U.S. Patent No. 2,077,171 to cover use of the NITRANA type solutions in ammoniation. Since that time, use of NITRANA solutions has expanded rapidly, and they are now one of the largest sources of nitrogen used by the mixed fertilizer industry.

Another benefit from ammoniation with solutions containing highly soluble salts such as ammonium nitrate is the development of temporary plasticity in the mixtures. During ammoniation at high rates, temperatures are attained that develop sufficient liquid phase in the mixture to confer good granulating characteristics. This incidental reaction has greatly aided the development of granulated fertilizers in recent years.

Allied Chemical chemists and engineers have known about and made laboratory studies of this particular aid to granulation since the early years of ammoniation. As far back as March, 1938, in Baltimore, Allied Chemical engineers were supervising plant scale tests of granulation of commercial mixtures with NITRANA solutions. During the 20 years since these tests, Allied Chemical has continued to pioneer in developing improved granulation techniques.

What's in the Future?

Nitrogen Division of Allied Chemical will continue its highly specialized research and development work in a never-ending search for new and improved nitrogen solutions. As in the past, the results of these efforts will be made available to producers just as soon as possible.

Meanwhile, make *your* future more profitable by making Nitrogen Division your headquarters for nitrogen products!

Entrance to one of the Nitrogen Division, Allied Chemical, Research Laboratories

Make Your Own Ureaform Nitrogen with N-dure®

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N-dure is Easy to Use

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N-dure is easy to use in your standard ammoniation apparatus, with, at most, only a few minor alterations in methods and equipment. Even where maximum conversion to this process is desired, the required alterations are reasonable in the light of the profitable results. Fertilizer manufacturers are finding that it is just as easy to learn how to use N-dure as it was to learn how to use nitrogen solutions.

Wide Variety of Ratios

N-dure enables you to economically formulate a wide variety of combinations of quickly-soluble and long-feeding nitrogen. You can easily control the ratio of fast-acting nitrogen to long-lasting nitrogen. You can make high-nitrogen, high-analysis fertilizers that are non-burning and leach-resistant.

The development of N-dure has opened up bright new vistas of profit for the fertilizer manufacturer. Fertilizers made with N-dure are now being used on many specialty crops. Fertilizers made with N-dure would have been ideal for many field crops under heavy rainfall conditions such as we had last Spring.

The Home Garden Market

But the biggest market for fertilizers made with N-dure today is the non-farm market. Twenty-two million home gardeners use more fertilizer per acre than farmers and pay a higher price for it. Highways, golf courses, playgrounds, cemeteries and nurseries are also big users of fertilizers.

These consumers prefer one-application, high-analysis, labor-saving fertilizers. That's why the new mixtures made with N-dure are proving very attractive. It will pay you to take advantage of this new interest in fertilizers to increase your sales and your profits.

Get the Facts!

Find out how easy it is to use N-dure to make your own ureaform nitrogen while you are making your mixed fertilizers. The demand for fertilizers containing enduring nitrogen is growing fast! Get your share of this booming market with N-dure. A Nitrogen Division technical service representative will be happy to show you how simple it is to fit N-dure into your production. Contact Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y.

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	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	26
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.188	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.052	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6	42.0	19.5	66.3	6.0	8.2	9.3	1.178	10	34
10	44.4	24.5	56.0	10.0	9.5	11.0	1.108	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.081	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
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A	45.4	36.8	—	32.5	30.7	16.2	0.925	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.972	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	—

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TYON

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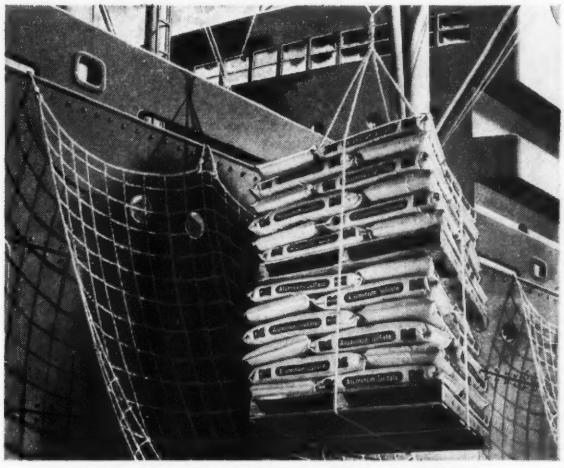
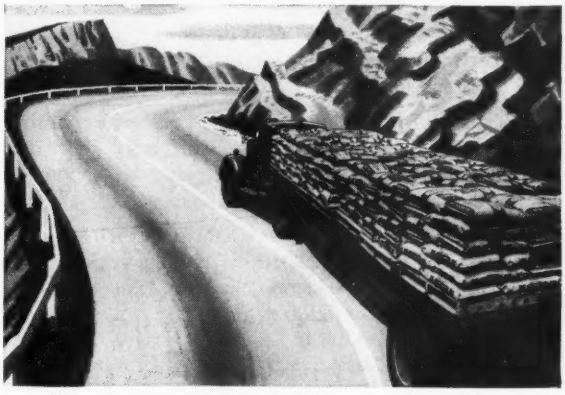


Stacked high or riding a sling, they cling. *Safer—resist slip and creep.*



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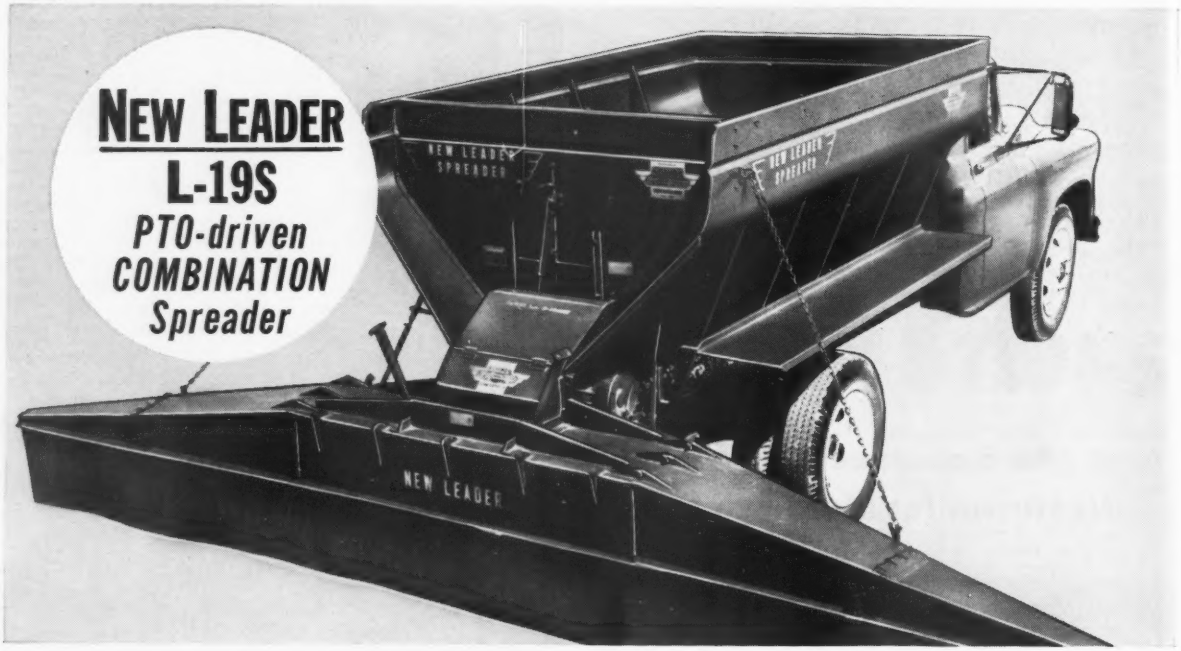


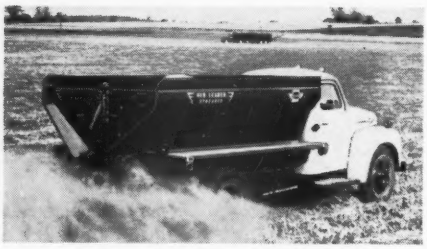
Wide 24" Conveyor and Twin Spinners Deliver Fast, Uniform Spreads!

Simple operation saves time and upkeep: set feedgate opening... start truck engine... start spreading!

The L-19S hopper body is 6" higher and more heavily reinforced than other lime spreaders. This means bigger payloads, with less blowing and no body warp or twist. 45° angle side slopes help prevent bridging and permit a lower center of gravity, a more attractive appearance.

Typical of its quality construction are such exclusive features as: dust and moisture-sealed gears with Timken roller bearings, heavy-duty roller-type conveyor chain and an optional endgate that swings completely open for stock piling.

New Leader **Engine-driven** COMBINATION Spreaders are also available: Model L-22S with a 7.0 h.p. engine and Model L-32S with a 12.5 h.p. engine to deliver plenty of power for heavy applications of lime or fertilizer.



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is a high quality rig with a low price tag!

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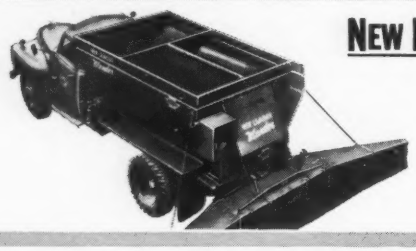
New Leader **Engine-driven** lime spreaders: Model L-52S has a 24" conveyor and is built for heavy-duty use. Model L-62S with a 30" conveyor is available for widespread applications. Both spreaders can also be used for fertilizer.



NEW LEADER L-42S Mobile Blender Accurately Blends and Spreads 3 Fertilizers At the Same Time!

Permits the operator to control both the amount of spread and ratio of 3 fertilizers depending on varying soil conditions! A 7 h.p. engine drives the twin spinners at a constant rate. A 36" belt-over-chain conveyor is powered from a driveshaft drive and synchronized to truck speed.

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CYCLONES CUT DUST

Supplementary collectors have helped Columbus fertilizer plant with air pollution problem

PLANT EQUIPMENT generally can be specified and designed without difficulty once the exact operating conditions are known. However, in many cases exact conditions are not known in advance and approximations based on related experience must be used as design criteria.

The Smith Agricultural Chemical Company of Columbus, Ohio experienced this situation recently in connection with dust collection equipment used to clean exhaust gases from the dryer and cooler in the production of granular fertilizer.

In planning the installation, there was no precise previous data to go by since the manufacture of granular fertilizer was a relatively recent introduction, and therefore neither the amount of dust to be collected nor the distribution of particle sizes were accurately known. Actual dust analysis, of course, was not possible prior to plant operation. Expected conditions were estimated on the basis of related experience and equipment specified accordingly.

It was originally anticipated that the dryer would exhaust 18,000 cubic feet a minute and that the cooler would exhaust 20,000 cfm. Dryer and cooler were each equipped with a pair of cyclone collectors, one pair slightly larger than the other. These collectors were expected to enable the plant to meet city dust control ordinances; however, upon operation it was found that the dust content of exhaust gases exceeded code limitations.

When this condition became known, the company asked the Buell Engineering Company of New York City to make recommendations.

Analyzing The Exhaust

First step was to ascertain how much dust was escaping. This was done by analyzing exhaust gases of dryer and cooler collectors. It was found that gases from the dryer collector contained 1.09 to 1.16 lbs of dust per 1000 lbs of gas, and that gases from the cooler collector discharged 1.26 to 1.38 lbs of dust per 1000 lbs of gas.

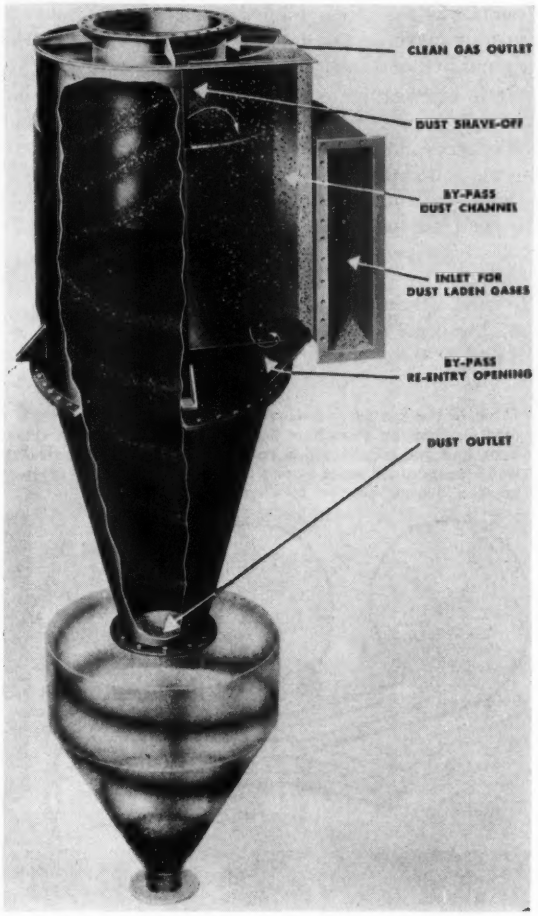
The city code, originally drawn up for fuel burning equipment, stipulated that the dust content of exhaust gases from fuel burning equipment should not exceed 0.85 lbs of dust per 1000 lbs of gas, corrected to 12 per cent CO_2. However, since neither the dryer nor the cooler would come under the classification of fuel burning equipment, it was decided that a reduction of emission of 0.4–0.5 lbs per 1000 lbs of gas, with no correction for CO_2, would be acceptable.

Next step was to analyze the dust for particle size distribution so that the proper collectors could be selected. At right is the breakdown ——→

In conducting these field tests it was also found that the volume of gas handled by dryer and cooler collectors was almost the reverse of what was anticipated. Dryer collectors handled some 20,000 cfm and cooler collectors some 18,000 cfm.

Second-stage Units

After studying this data, it was recommended that the existing collectors be reversed and that they be supplemented with high-efficiency second-stage units comprising four cyclones each. (*Turn page*)



Buell collector has shave-off port to provide outlet for fines that accumulate in eddy currents near top of cyclone. Fines delivered to cone empty into hopper below.

Particle Size (Microns)	Dryer Escape Dust-%	Cooler Escape Dust-%
over 45	1.65	.70
40–45	.05	.03
35–40	.09	.04
30–35	.18	.09
25–30	.43	.19
20–25	.60	.37
15–20	1.60	.88
10–15	4.40	2.30
5–10	18.10	11.30
under 5	72.90	84.10
	100.00	100.00

Dust collector efficiency at fixed gas velocity is related to the volume of gas handled. Generally speaking, for a fixed gas velocity a collector handling a lesser volume of gas through a small intake port will be more efficient than a cyclone of the same approximate diameter having a larger intake port and handling a larger volume of gas. Thus, high-efficiency collection requires more cyclones and the desire for additional efficiency must be balanced with the cost of the additional equipment.

The original two-cyclone collectors on the dryer and cooler operated at 84 and 93 per cent efficiency respectively. In adding the new second stage units, design was for much higher efficiencies, and hence the four cyclones per unit instead of two as in the original installations.

It is interesting to note that once the operating conditions were known, calculated performance tallied very closely with actual performance. Calculations indicated that upon the installation of the second stage units dryer loss would be 0.42 to 0.48 lbs per 1000 lbs of gas and cooler loss would be 0.37 to 0.40 lbs per 1000 lbs of gas. Actual results, as obtained by tests conducted by the Columbus Division of Smoke Regulation, were dryer loss of 0.41 lbs per 1000 lbs of gas and cooler loss of 0.44 lbs per 1000 lbs of gas, well within prescribed limits.

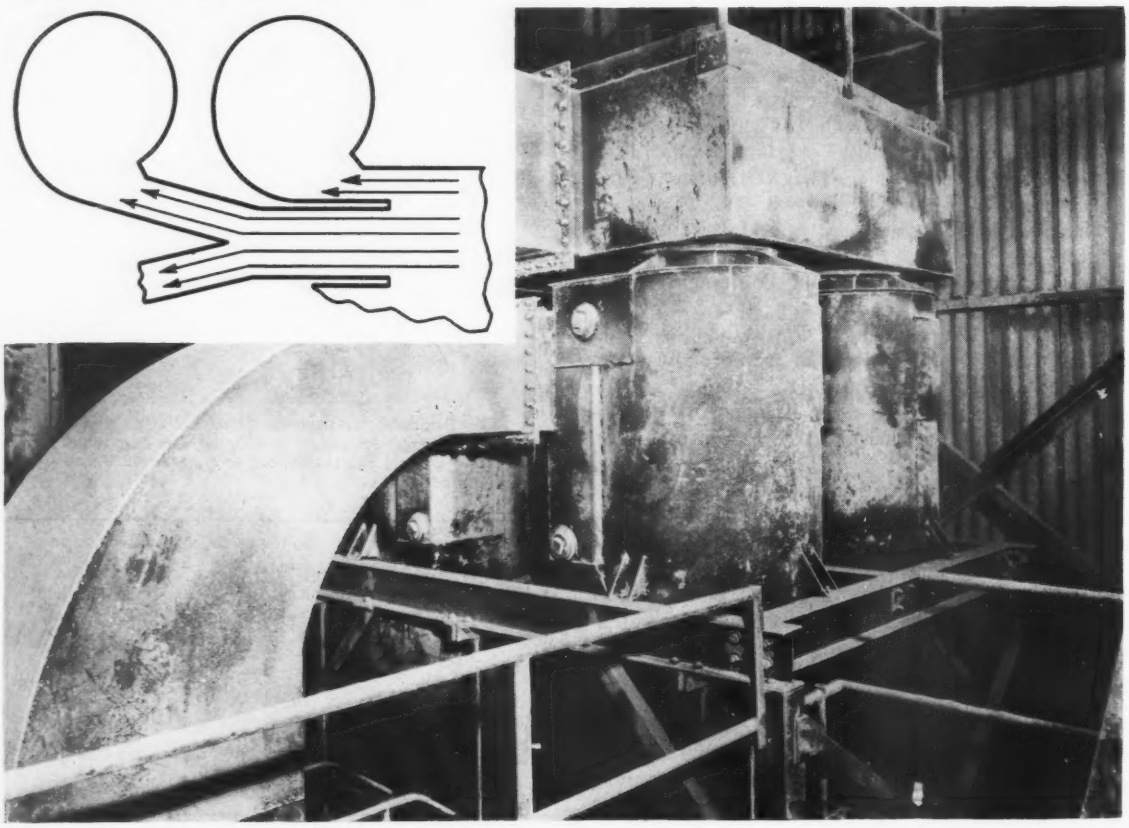
Inside the Cyclones

Gases enter the cyclones tangentially from a split-duct manifold without loss of pressure due to change in direction. Within the cyclones, the solids are thrown by centrifugal action to the cyclone wall and due to the airflow pattern, which is a descending helix at the cylinder periphery, the dust is carried downward and discharged to conical outlets and into the hopper below, the cleaned gas ascending in a helical manner at the center of the cyclone and leaving through the outlet pipe which extends down into the cylinder. From the hopper, the reclaimed fines are returned to the process.

The collectors have a special efficiency feature. A narrow vertical rectangular port in the upper portion of the cylinder provides an immediate outlet for fines which tend to accumulate in eddy currents which prevail in this portion of the collector. These fines are conducted through a bypass duct to the main body of dust in the lower conical section of the collector. Thus, they are collected and not exhausted to the atmosphere.

According to the Columbus Division of Smoke Regulation, since installation of the second stage collectors, complaints on dust emission from this plant have practically ceased. ▲

ONE of the two second-stage cyclone-type dust collectors installed at the Smith Agricultural Chemical Co. Collector cyclones receive incoming gases from first stage cyclones through curved duct (left). Cleaned gases exit through ducting above cyclones. Separated dust is collected in common hopper below conical sections of cyclones. INSET shows drawing of the split-duct manifold which proportions gases among four cyclones of each second stage collector. Gases enter cylinders tangentially without loss of pressure due to change of direction.



HOW WELL DOES TREBO-PHOS* GRANULATE?

Cyanamid's Triple Superphosphate in typical commercial run produces granular 5-20-20 of outstanding quality.

1. **EQUIPMENT**— TVA Continuous Feed Ammoniator; Co-current Dryer; Con-current Cooler

2. **FORMULA**

MATERIALS	LBS
TREBO-PHOS Triple Superphosphate — (APA 48.28%; Ins. 1.04%; H_3PO_4 3.09%; Moisture 7.25%.)	628
Normal Superphosphate	493
Nitrogen Solution: (25% NH_3; 69% NH_4NO_3)	62
Anhydrous ammonia	88
H_2SO_4, 66° Be	130
Potash	645

3. **RESULTS**

Production rate: 20 tons per hour
Through-put production: 82%
GRANULATION: EXCELLENT

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KEEP THE FARMER'S C

Good fertilizer laws, labels, courteous employees, accurate weighing and written guarantees of bulk materials— All help you to

A GOOD fertilizer law and good enforcement is a "must." I say this partly because the dry product handled by the fertilizer industry has many of the physical properties of sand and the liquid product handled by the fertilizer industry has many of the physical properties of water. This being the case, it is necessary that the fertilizer consumer obtain and retain confidence in the product for which he is spending his money.

In Indiana the first fertilizer law was passed in 1881. It was not until 1907 that the feed law was passed while the seed law was not passed until 1921. We might speculate that farmers felt they could tell something about the quality of feed and seed by its appearance but learned early that a chemical test was necessary to determine fertilizer quality.

Of course, the early farmers had one additional test they could apply to their fertilizer. I refer to the fact that the early fertilizer consisted for the most part of packing house by-products and we are informed that they attempted to judge the quality of the fertilizer by its odor.

We often marvel at the good sense our forebears used in framing fertilizer legislation. For instance, the Indiana Fertilizer Law lasted for upwards of 70 years with very little change and then was only changed to accommodate changed marketing conditions. Due to the nature of the commodity, fertilizer laws are essentially labeling laws. Therefore, the activities of the control office are centered on such problems as seeing that it is clearly labeled so the customer can know what he is buying, see that it is labeled correctly, see that the farmer is not misled in other ways, and give the farmers confidence in the product they are buying.

The Power of Labels

Labeling is a powerful force for good. For example, we can recall when sewage sludge was sold in Indiana without detailed labeling and recommended to be as good as 2-12-6. When this sewage sludge was labeled under its low fractional guarantees, the sales soon dropped to zero. We have had experiences in our state of a material being sold as a soil conditioner which was represented to be as good as fertilizer. When this material was labeled as a 0-0-0 fertilizer, sales immediately dropped off except to those who are enthusiastic about organic farming.

On the other hand, we recognize that some people cannot be protected from themselves. They can only be protected from misrepresentation. About all that a fertilizer control official can do is to see that a prospective purchaser knows exactly what he is buying and to see that the product is not misrepresented when offered for sale.

Building Trust in Your Label

The use of chemical fertilizer has greatly increased in this country but, if the full potential of fertilizer is to be reached, the volume needs to be doubled or trebled. Anything that shakes the confidence of the farmer in the product he is to buy is detrimental to increased volume. To maintain the confidence of the farmer in the "unseen" values in the fertilizer bag, I would make the following suggestions:

Employees should be carefully selected if they are to meet the public and each employee who comes in contact with the public should have a "flair for public relations." For example, an Indiana farmer went to a fertilizer factory and order a truckload of bulk fertilizer. Somewhere along the line, he was given the wrong invoice. The farmer complained that the invoice did not carry the grade he ordered but the employee rudely brushed his questions aside. Naturally, the farmer worried and, as soon as he got home, he called the control office. The farmer stated he asked for inspection because he felt that, if the company was careless in one way, they would be careless in others and he wanted to be sure that he got his money's worth.

Another example of a situation where carelessness lost confidence can be illustrated by a farmer only a couple of weeks ago who went to a fertilizer plant

A. S. Carter is Director of Seed Control and State Chemist Services, Purdue University. This article is taken from his talk last October at the conference on chemical control problems sponsored by the National Plant Food Institute.

to buy several truckloads of fertilizer. Each time before he left his home town he weighed his truck empty and he weighed it again over the same scales loaded. He found that one load was 1,000 pounds light and one load was 3,000 pounds heavy.

We must admit that he did not care to make an issue of the net overweight; however, the farmer did get the idea that the company was careless and asked for an inspection making the same statement as the first that if a fertilizer company is careless in weights, they might also be careless in matters pertaining to analysis.

A second method of alienating a farmer's confidence is to change the labels on the fertilizer bag in some way. Remember that after all the fertilizer looks somewhat like sand. When the analysis is changed with a pencil, the farmer is likely to get the idea one had when he told me, "If all you have to do to raise the analysis of a fertilizer is to mark it up with a pencil, I could do that without causing the fertilizer com-

S CONFIDENCE

BY A. S. CARTER

pany all the trouble of marking up their bags."

Another example of this same thing is the question raised when the bag branding and tags do not agree as to the guaranteed analysis. *If a farmer questions the analysis of a fertilizer, we feel that you should tell the farmer you have confidence in your product and suggest that the state control office be notified and official sampling be requested.* Face the issues openly and positively and urge official sampling. Do not urge the farmer to send samples. You do so at your peril. The indiscriminate testing of samples submitted by farmers can lead to a great deal of confusion.

We know of one farmer who sampled fertilizer in his cap as the fertilizer ran out of the bulk truck. The result was a sample that was 8 per cent lower in nitrogen than the actual contents of the truck. Official samples are somewhat costly for the control office but that is their business. Drawing official samples in cases of this kind is the only way to be fair to all parties concerned.

Written Guarantees

Confidence of fertilizer buyers becomes shaky with new forms of fertilizer or new methods of merchandising. For example, when bulk fertilizer usage first became wide-spread, we were asked this question about every day. "How can I get my money's worth in bulk fertilizer?" When liquid fertilizer came on the scene, the same question was asked. "How can I get my money's worth in liquid fertilizer?"

The answer to both these questions is the same. Get the guarantee in writing on the invoice or delivery ticket which accompanies the fertilizer and, if there is any doubt as to the quality of the fertilizer, ask for official inspection. The same instructions should be given for bulk fertilizer, liquid fertilizer and bagged fertilizer. *Get the guarantee in writing and refer the matter to the control official if there is any question pertaining to the analysis.*

Price is a factor in fertilizer distribution and competition is the order of the day in the industry. Control officials are not directly interested in price. A farmer can pay $800 for an item or he can pay $80 for the same item. However, he should do so with his eyes open. He should be encouraged to buy on the basis of analysis rather than on the statements of the salesman. This fact leads us to a discussion of custom mixing.

Grade and Equivalence

We feel that while fertilizer sales are on a competitive basis, the competition exists around grades of fertilizer. For instance, a farmer is offered a fertilizer that is an equivalent of a 10-10-10 at a greatly reduced price. What is meant by equivalent? In one instance it meant that a supply of raw materials would be furnished at the advertised price which would force a farmer to go over his field 2 or 3 times in order to get the fertilizer distributed.

We received a letter from a farmer who had gone into a neighboring state and got a custom mixed fertilizer for $59.75 per ton for what was sold to him as a 12-12-12. He accepted delivery in bulk. He was told that he saved $20 over the price he would have paid to a regular fertilizer dealer.

However, when we calculated some other factors that entered into the transaction such as bagging and bulking charges, the hauling charges, the cash discount, and possible commissions were taken into consideration, he did not save $20 but less than $5. Then, he had a product with one item being questionable in availability and with a product that would probably set up as hard as concrete unless it were spread immediately. We feel that farmers should deal with distributors who are willing to guarantee the grade in writing.

Manufacturing Losses

When deficiencies do occur the control office has no choice but to insist that restitution be made in accordance with the law and that greater care be used in making fertilizer that will be up to guarantee in every particular when the farmer receives it. If manufacturing losses occur, it is not the fault of the farmer. The farmer and the control office will expect the manufacturer to try to stop the losses and, in the meantime, to overformulate to such an extent that after the losses have occurred the farmer will get the grade he pays for.

We are happy to know that the fertilizer industry is working cooperatively to learn some of the answers to these manufacturing problems and to correct them. Excessive overformulation is no permanent answer. In the meantime, the control office will have to work diligently to protect our reputation and yours. ▲

BE SAFE with fertilizer-pesticide mixtures

BY JOHN MARK

John Mark is production manager of the chemical processing division, The Farm Bureau Cooperative Association, Inc., Columbus, Ohio.

USE of fertilizer-pesticide mixtures for farm crops is growing rapidly. It is estimated that some 200,000 tons will be used in 1958. This will be a 100 per cent increase over 1956. Three states—Iowa, Florida and South Carolina—accounted for 50 per cent of the 1956 tonnage sold. The use of these mixtures started in the southeastern part of the United States. The northern half of the United States has moved slowly toward the use of fertilizer-pesticide mixtures, but the trend is steady and within a few years will account for a sizable amount of the total fertilizer sold.

Many kinds of pesticides in varying amounts are used in fertilizer mixtures. I suppose that every pesticide produced has been incorporated in fertilizer mixtures at some time or other and other types will be tried as they are developed. The most popular one in use at the moment appears to be aldrin, although heptachlor and others are also used extensively.

From the standpoint of safety it is not too important to identify by name the pesticide used in mixing. But it is important that we are familiar with the degree of toxicity of the material we are using and its hazards to people mixing the materials. Safety data sheets have been published on every pesticide in use and operators should take the time to read these—for their own protection.

In many cases this is not done. Because actual experience in fertilizer plants indicates that there have been very few reported cases of physical damage to people who work around pesticides, there is some tendency toward sloppiness in handling them. We hear so many times the statement that we have been mixing fertilizer-pesticide mixtures for years without any special precautions and nothing has happened. I can't think of a more dangerous attitude to have about this. We are just asking for trouble.

To help us jolt ourselves out of this complacent attitude let's look at another hazard we work around every day. We work around electricity day after day in apparent safety. Then, one day something happens, a slip here, a dangerous act and someone is badly burned or killed by electricity. While pesticides do not kill as quickly, they will do the job just as effectively. As the use of pesticides in fertilizer mixtures grows so will the hazards and it's time we begin to treat these materials with the respect they deserve. The one thing we should remember above all else, is that these materials are *poisonous*, to human beings as well as pests.

There are two forms of pesticides—liquid and dry—used in fertilizer mixtures. In recent years progress has been made toward development of specific types of equipment that are suited to proper blending of fertilizer and pesticides and do the job with reasonable safety to personnel.

Recently Edward Largent of Ohio State University put together for the Fertilizer Section, National Safety Council, a safety procedure which will be recommended for use by fertilizer manufacturers. Information on pesticides has been grouped so that we in the fertilizer industry can make better use of it, and detailed first aid instructions are included.

Here are the basic safety procedures that should be used when handling fertilizer-pesticide mixtures:

STORAGE

Always store pesticides in an isolated place away from inplant traffic and where packages will not be damaged or broken. Utmost care should be taken to avoid spillage or contamination of materials with pesticides, except those with which mixing is intended.

HANDLING AND MIXING

Take to the mixing unit only enough pesticides to mix whatever amount is to be made. Take back to storage any that is left immediately after completion of mixing. If you use liquid pesticides, immediately cap barrels or drums after mixing is completed.

PERSONNEL SAFETY

All persons handling pesticides must wear gloves and masks. Avoid contamination of clothes and spillage on skin. If contamination should occur, in the case of clothes, remove clothing at once. If pesticide is spilled on skin, wash immediately with plenty of water. The hazard to health from pesticides is caused by:

- Inhalation and long exposure
- Ingestion
- Absorption through the skin, especially through breaks in the skin

PERSONAL HYGIENE

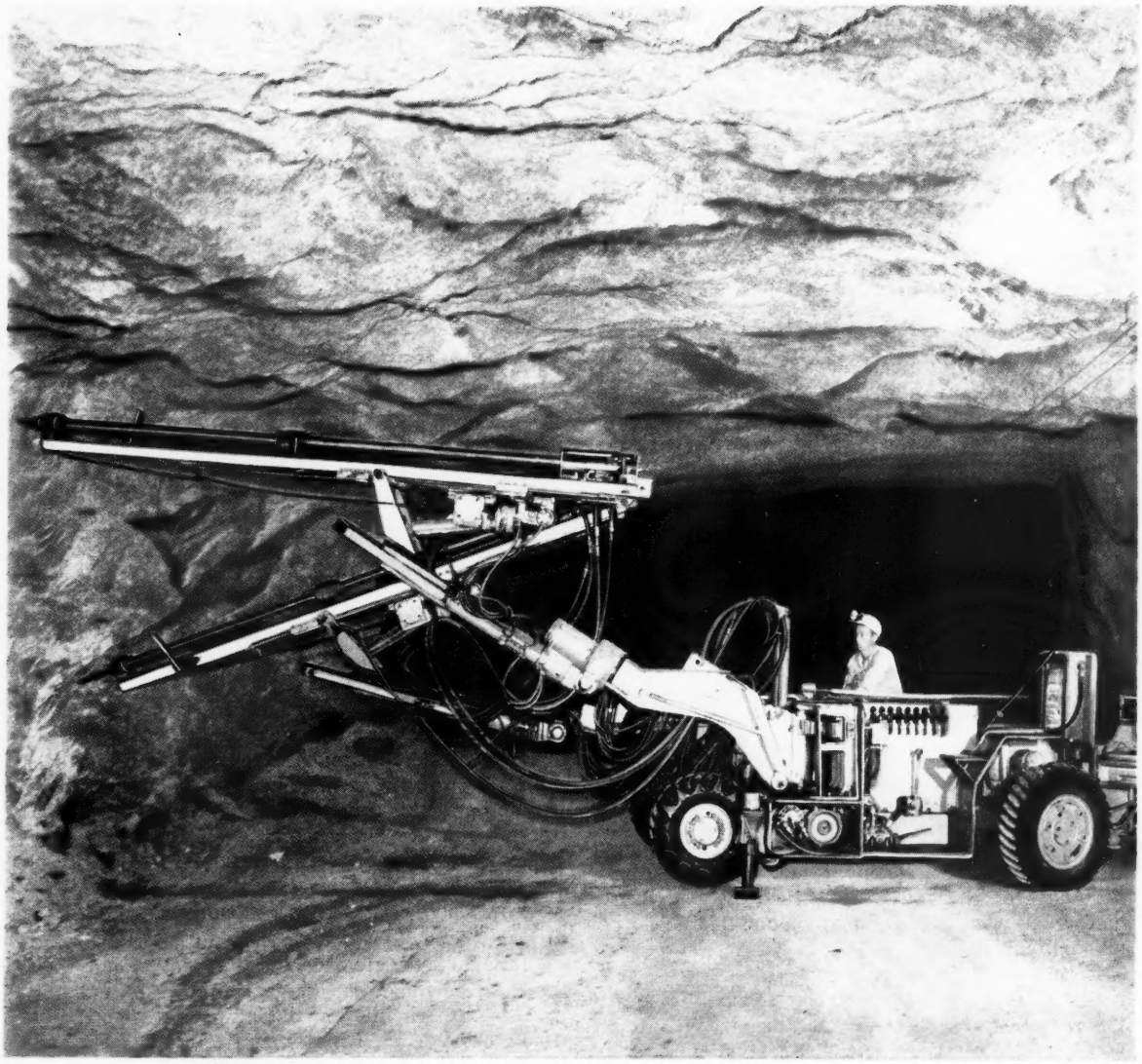
1. Always wash hands and face before drinking or smoking or eating.
2. Do not smoke, drink or eat in the mixing area.
3. Do not wear work clothes home that have been worn in mixing areas where pesticides have been used.
4. Always take a shower before leaving plant to go home.

WORKING AREA AND EQUIPMENT

It is recommended that dry pesticides be mixed with fertilizers in a mixing drum.

With liquid pesticides the equipment should be isolated as much as possible.

In both cases ventilation should be provided to draw off fumes or dust. ▲



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The farmer-businessman must be shown that fertilizer can increase his efficiency—by boosting profit per acre

Excerpts from a talk by R. L. Balser of Spencer Chemical Company and A. D. Woltemath of the National Plant Food Institute, presented at the subdivision on plant nutrients of the American Society of Agronomy meeting last month.

FERTILIZER

THE TREND toward greater corn growing efficiency is well established. There is urgent need for extending this efficiency further in a fast-changing agricultural economy.

Of all factors involved, evidence points to fertilizer and lime as most important in stepping up the farmer's profit from corn. There is widespread support of this general deduction. A group at Iowa State, for example, set down a list of yield improving practices and weighed the part that each would play in increasing the yield of corn from 50 to 85 bushels. The use of more fertilizer and lime topped the list.

This importance of plant nutrition can be seen by driving in nearly any rural community in late summer. It is not unusual to see an outstanding crop on one side of a fence and a poor one on the other.

Entomologists have done a good job of converting insect damage to a dollar and cents basis. They report, for example, that in 1955 the corn borer alone ate 5 percent of the nation's corn crop, for a loss of 155 million bushels and 182 million dollars. If one could place a dollar loss figure on the bushels that were cheated out of existence by inadequate diet, think what a staggering amount this would be on a national basis!

Corn growing is big business. In fact, it has few rivals in its bigness in this great economy of ours. Corn growing as a business dwarfs such big operations as General Motors, American Telephone and Telegraph, and General Electric. It is a 3½ billion dollar operation.

Efficiency in corn production is the employment of effective operations to result in greater earnings, not greater yields. Although it is true that yield figures in an efficiency analysis, it is not the desired end in itself.

The principles of efficient corn production have practical applications in growing other crops.

Fixed Costs Are High

Compare the cases of two corn farmers in the corn belt. One farmer, Joe Average, is an average farmer and is lucky to raise 60 bushels of corn per acre. The other farmer, Dan Best, is a progressive farmer and uses recommended practices. He raises 90 bushels of corn per acre.

What does it cost to raise an acre of corn? A farmer needs to know these costs in order to know which segment of his operation is providing the profit. The more he knows about the costs of his operation, the better equipped he is to operate efficiently.

Let's consider first the *fixed costs* of growing an acre of corn. The first general expense is the Land Charge and includes $10.00 per acre interest on the land investment ($200 per acre at 5 per cent) and $2.40 for taxes. The total Land Charge, then, is $12.40.

The Machinery Charge includes $3.70 per acre for hauling manure, $3.00 for plowing, $2.15 for disking twice, $0.60 for harrowing, $1.50 for planting, $2.70 for cultivating twice, $4.00 for picking, and $3.00 for hauling and cribbing the corn (at $0.05 per bushel). The total Machinery Charge, then, is $20.65.

Other fixed costs include the charge for labor (in addition to labor in above machinery jobs), lime, manure and seed. The total fixed cost of production, $46.55, is a much larger figure than most farmers are willing to admit. Fixed costs make up the major part of the corn production costs. The corn grower has committed that much expense at the time that he decides to grow corn. Since he is not assured of a corn crop at this time, this commitment represents the big risk in growing corn.

The fixed costs for both Joe Average and Dan Best are the same. It requires about the same fixed costs to grow a poor corn crop as a good one.

It Takes Money to Make Money

Variable costs are expenses that may or may not be spent on the crop. These are the costs that test the managerial ability of the farmer. It is generally this area of decision that separates the efficient and inefficient producer.

Due to his increased yield, Dan Best has an increased cost of $1.50 for picking, hauling and cribbing. The field operation of broadcasting fertilizer cost $1.50 per acre and he increases his fertilizer application from $4.00 to $16.00 per acre.

Joe Average Yield 60 Bu.		Dan Best Yield 90 Bu.
$46.55	Fixed Costs	$46.55
	Variable Costs	
	Extra Hauling, Picking, Cribbing	1.50
	Broadcasting Fertilizer	1.50
4.00	Fertilizer	16.00
4.00	TOTAL	19.00
$50.55	TOTAL CORN GROWING COSTS	$65.55

The big increase in cost is for fertilizer; however, it is still relatively small compared to the total per acre cost. Many farmers think that the cost of fertilizer represents half of their corn production expenses when they kid themselves about their actual fixed costs. The cost of fertilizer is not only a relatively small expense but it also represents a relatively small risk.

R FOR PROFIT

Comparing the cost per bushel of these two farmers, we find that Dan Best is producing corn for $0.73 per bushel, while it costs Joe Average $0.84 per bushel. That means that Dan Best is actually making $0.11 more profit on each bushel than Joe Average. Should the price of corn drop to $0.80 per bushel, Dan Best will still be making a profit, while Joe Average will be "in the red."

Profit Tells The Story

The progressive farmer is shooting for profitable yields and he is aware of his costs. Yet he realizes he is operating a business and must make a *profit*. Here, too, Dan Best comes out ahead. His profit per acre is $24.45 as compared to only $9.45 for Joe Average. The $15.00 extra investment in fertilizer actually gave him $30.00 extra return—that's $2.00 back for every $1.00 spent for fertilizer. Few other investments on the farm will compare to that of fertilizer.

Joe Average Yield 60 Bu.		Dan Best Yield 90 Bu.
$50.55	Total Corn Growing Costs	$65.55
	Corn Crop Income	
60.00	Gross Return at $1.00/Bu.	90.00
9.45	Profit Per Acre	24.45

These figures are conservative. With the market price of corn at $1.00 per bushel at harvest time. many farmers ease the price-cost squeeze by storing their grain on the farm until prices are more favorable. Then the return per dollar invested becomes even more favorable. If Dan Best received $1.20 per bushel, for example, then his profits would have increased to $36.00 per acre, or $2.40 returned per dollar invested in fertilizer.

Intelligent fertilizer use can spell the difference between profit and loss. The use of the soil test is the best single tool in determining adequate fertilizer usage.

Fewer Acres and Less Bushels

Assume that each farmer needs $1,000 profit from his over-all farming operation. Joe Average requires 106 acres to get it, while Dan Best gets the same profit from 41 acres. Dan Best can maintain his profits even though acreage allotments have been cut.

Everyone worries about surpluses, but the farmer still wants his corn to contribute a certain amount to his income. Here, again, adequate fertilizer can provide the answer. Joe Average must raise 6,360 bushels of corn to maintain his $1,000 profit, while Dan Best can get it by raising 3,690 bushels. *Therefore, the intelligent use of fertilizer means more profit on fewer acres and less total bushels produced—two important features in these times of allotments and surpluses.*

All the other factors of production, previously mentioned, will also add to this efficiency factor. We are using fertilizer as an example because it is the one factor which most often limits farmer's yields.

Empty Seats on The Efficiency Bandwagon

One of our most urgent problems, then, is to get more farmers to use adequate rates of fertilizer. Only 11 percent of the farmers in the U. S. and 9 percent in the north central region fertilize either of their two most important crops at recommended rates. About 37 percent in the north central region used no fertilizer at all on either of their two most important crops. The information is available to the farmer. The recommendations have been made on fertilizer practices. And yet, the farmer has not heeded them. The big problem is still "getting the farmers to use fertilizer." It is largely a problem of communication.

Farm magazines and agriculture leaders many times stress refinements in applying fertilizer. These refinements are really important only to those using recommended rates of fertilizer and those farmers are relatively few in numbers.

According to the 1954 census, 79 percent of the farmers in the Dairy Belt used fertilizer on corn and their average rate was 267 pounds per acre. About 76 percent of the farmets in the Cotton Belt used fertilizer on corn and their average rate was 301 pounds per acre. And 50 percent of the farmers in the Corn Belt used fertilizer on corn and their average rate was 208 pounds per acre. It's easy to see that few farmers have been hurt by over-fertilization, but many have been hurt by under-fertilization.

Three points need special emphasis in the future:

- We need more fertilizer education programs for the non-fertilizer users and also for those farmers who are fertilizing below recommendations. The fertilizer story in basic, simple terms should be told again and again until it finally has an impact on the farmer and he has been motivated to act.
- We need to create an awareness of corn production costs. There is a lot of difference between actual costs and actual outlay of cash. Most farmers at least have an idea of their cash expenses but few are aware of their total crop production costs. How can you know your profits until you know your costs? The sooner they become aware of their actual costs, the sooner they will be willing to spend a few extra dollars for the income improving practices.
- We need to conduct *profit contests* instead of *yield contests*. *High yields* appeal largely to the prestige and personal satisfaction of the farmer, but profits appeal to his very comfort and well being. Steps to increase the farmer's awareness of his expenses and profits will soon result in higher yield goals and a more business-like approach to corn production. ▲

Wise use of fertilizer and lime is the most important step the farmer can take to make more corn profit

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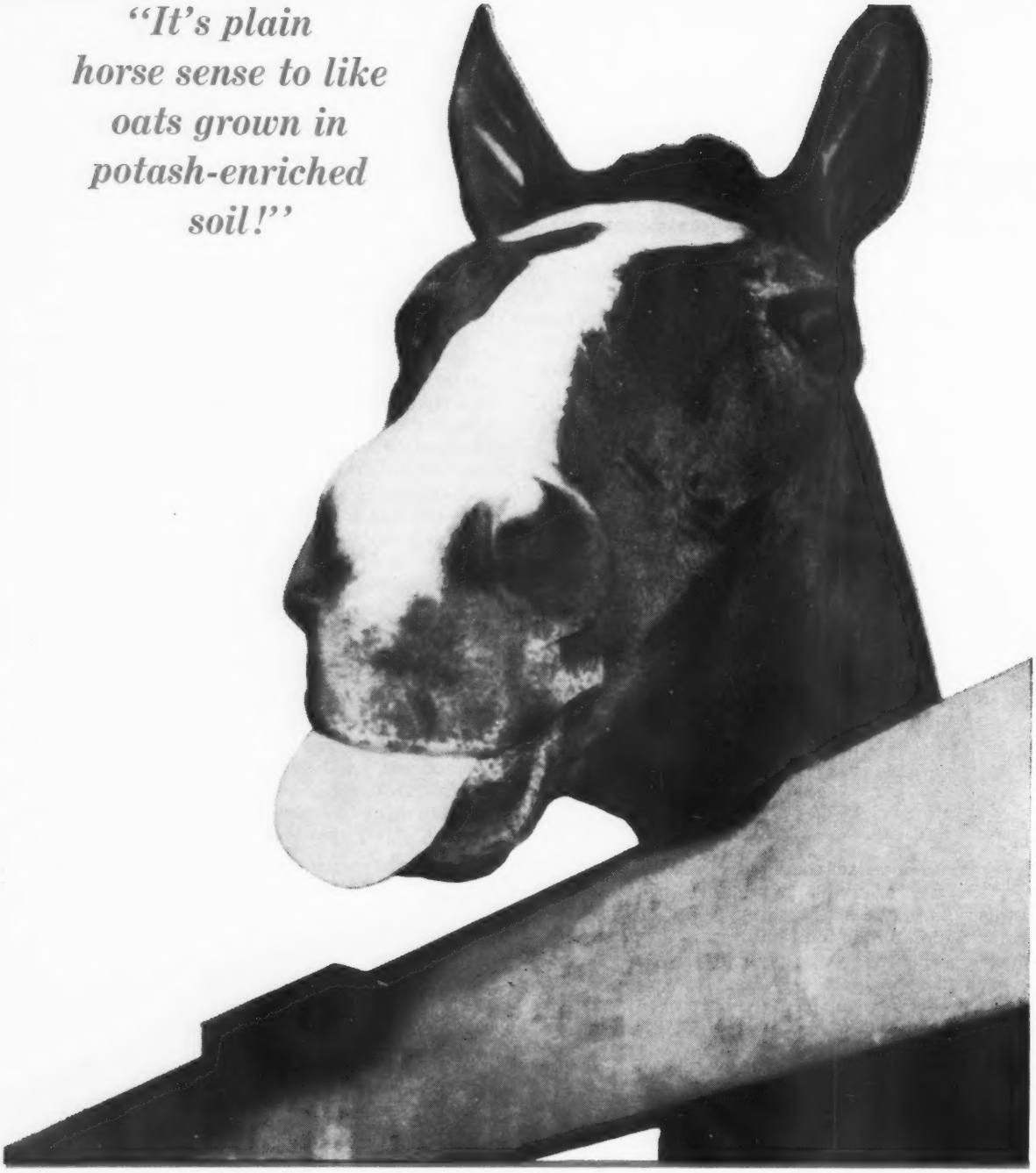

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Excerpts from a talk by Moyle S. Williams, chief agricultural economist of the National Plant Food Institute, presented at the subdivision on plant nutrients of the American Society of Agronomy meeting last month.

HOW MUCH?

An agricultural economist dicusses four ways to estimate potential future plant food use, then makes his own estimates for 1965

BY MOYLE S. WILLIAMS

A REALISTIC LOOK at potential fertilizer use is important both to the educator and to the fertilizer industry. To the extension agronomist it can indicate what kinds of programs and efforts are needed in educational programs relating to soil fertility and fertilizer use. To the industry it can indicate the potential market and help in planning production and marketing programs. For every company must make estimates and these estimates must be revised.

When we are talking about potential fertilizer needs, we really are talking about what is needed on the many different kinds and sizes of farms, on the many soil types, the many different crops and under many different managerial levels and conditions. To get a realistic potential requires aggregating all of these individual needs into a total figure that has meaning for a region or for the country as a whole. It is a very complicated and difficult problem.

This is particularly true since the use of fertilizer cannot be separated from the other managerial decisions and the other farming practices which the farmer decides to use. He always has alternative ways of producing a given crop, of using his land and other resources.

For this reason, I think it is impossible to predict accurately what fertilizer needs will be in the future. However, I think we can set forth some reasonable assumptions from which to proceed in order to obtain an estimate of the magnitude of the need. In other words, we can determine whether it appears that farmers should be using twice as much, three times as much or ten per cent more fertilizer than they are now using.

A number of different approaches to the problem of estimating fertilizer consumption patterns have been used. The four principal ones are: *projection of trends, crop requirements and removal, estimation of requirements based on soil sample information*, and *the statistical-mathematical model.*

Projection of Trends

This usually means taking some base period and assuming that the same rate of change will occur in the future. While this is very helpful and can give us valuable information, it has the major weakness of not being able to take into account any changes in direction. A case in point is what has happened to fertilizer consumption since World War II. If we used the period from 1942–43 to 1952–53 as our base period and projected the trend, we would end up with a consumption for 1956–57 of 6,967,000 tons of primary nutrients or almost 600,000 tons above what farmers actually used. The build-up of surpluses, the changes in world markets and many other factors caused the trend to change.

Trend projection is perhaps most helpful when projected for a number of years in the future. If we use the period 1945 to 1955 as a period from which we project our trend, we may end up with a pretty realistic figure for 1975. This is helpful in terms of long-run planning, but is not very helpful in planning production of fertilizer for the two- to three-year period immediately ahead.

Crop Requirements and Removal

This method of estimating need is based on the knowledge that crops remove a certain quantity of plant nutrients from the soil. By taking the amount of the various crops produced and multiplying by the plant nutrient removal figures, we can estimate about how much fertilizer would be needed to replace nutrients required for such production. Dr. W. H. Garman, chief agronomist of the National Plant Food Institute, has used these references in developing recent data that show the estimated difference between nutrients applied (in manure and fertilizer) and nutrients removed (by crops and lost annually in the Ohio and Mississippi Rivers) is 356,881 tons of primary nutrients. To replace this deficit would require the equivalent of approximately 4½ million tons of 10-10-10 fertilizer annually. The deficit would be much greater if losses due to leaching and soil erosion were included, notwithstanding gains arising from nitrogen fixation and rainfall.

This is a very helpful figure, but has some limitations. It has been obvious for some time that farmers are not using the necessary amount of plant food to replace that removed by crops, not to mention that lost by erosion. The difficulty in the estimation of the amount of plant food made available by manure and by cover crops and crop residue, the difference in soil conditions and availability of nutrients and other problems present some difficulty in using this as a measure. Another problem with this method is that we do not take into account the economic conditions which we know have an effect on the amount of fertilizer that farmers will actually use.

Estimates Based on Soil Tests

Several states have prepared summaries of information based on soil tests for the crops in different areas, which have been used as a basis for estimating the total plant food requirements of the state. This appears to me to be one of the most helpful methods

to estimate present and future fertilizer needs. Unfortunately, this method too has some limitations. For one thing, we know that the farmers who take soil samples generally tend to be the better farmers. In many cases their soils are higher in plant nutrients than those of the average farmer, and there is a tendency to sample fields from which they produce their principal crops where they probably have been fertilizing at a heavier rate than the average in the region. *An underlying assumption of this method is that the soil test recommendations offer a realistic guide to fertilizer needs.*

The survey conducted by Dr. Werner Nelson and the Farm Management Committee of the NPFI Research and Education Committee gives rather strong indications that many current recommendations are below those that research would indicate are most profitable for the individual farmer. In other cases, I am sure the recommendations may be higher than the individual farmer actually will use. However, despite these limitations, this is still one of the most helpful methods that has been used in arriving at a realistic look at fertilizer needs.

The Statistical-Mathematical Model

This is the tool that the economist and statistician have long used in attempting to predict or estimate what future demand will be. Some experiences have been very encouraging and others have been very unproductive. The best known example of this method is the work of Dr. A. L. Mehring, relating farm income and fertilizer consumption. The factors used were: (1) farm income from crops plus government payments in previous years; (2) the proportion of the previous year's income remaining after expenses of production have been deducted and (3) the same year's farm income. This equation gave a very close estimate from 1911 to 1949.

This method is essentially an attempt to determine those factors which can be measured and that have a weight in determining future consumption. Several persons have worked with this technique. Dr. Earl Heady of Iowa State College and Dr. Zvi Griliches have done some of the pioneer work on demand for fertilizer. NPFI is cooperating on a research project using this technique at North Carolina State College under Dr. R. A. King.

This method is based on analysis of historical relationships and hence has the weakness of assuming that the future will be like the past and present. It is helpful in determining the factors that need to be watched closely as indications of future trends. It has the same weaknesses as a trend projection, the principal one being that it is almost impossible to catch abrupt changes in the consumption pattern.

It seems to me that none of these alone is sufficient to give us a realistic picture of what we presently should be using or what we can expect. *However, I believe a combination of these methods can be used to give us a reasonably good idea of what fertilizer needs will be in the future.*

When we are looking at what will be needed in the years ahead, it seems to me that we have to start with what the needs in terms of food, feed and fiber will be in the future.

Dr. Rex F. Daly of the U. S. Department of Agriculture says the domestic requirement for food and other farm products is expected to expand about 20 per cent from 1955 to 1965 and possibly around 50 per cent by 1975. These gains are a little more rapid than the anticipated growth of population. Assuming a continuation of the increase in consumer incomes, domestic use per person should increase about 3 per cent by 1965 and around 8 per cent by 1975.

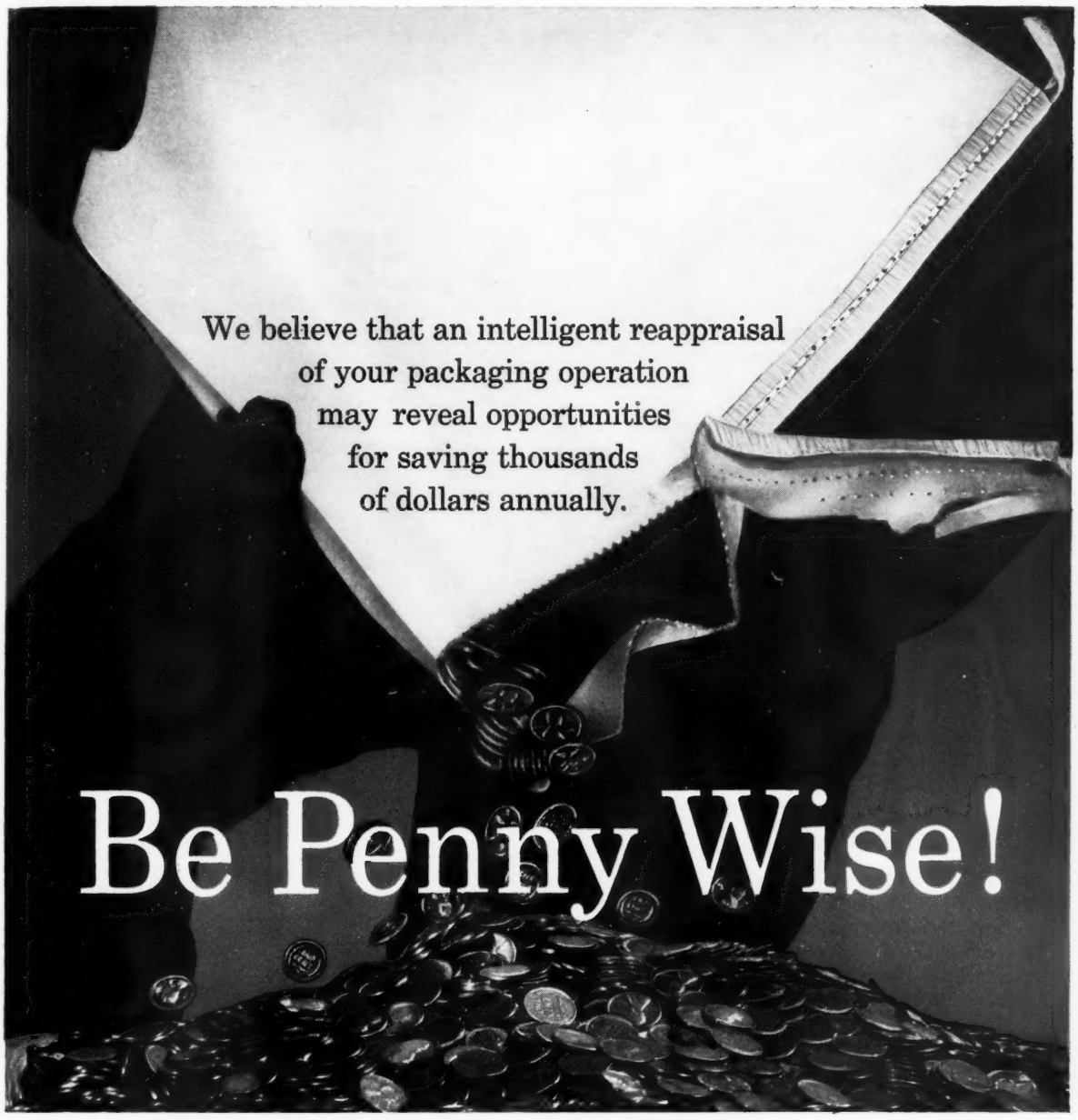
Total requirements are based on the projected population growth of 37 per cent from 1956 to 1975. Dr. Daly estimates that there will be substantial change in domestic requirements by 1975. He expects the requirement for livestock and livestock products to increase around 45 to 50 per cent. Food requirements are based on the projected output of livestock products. It was assumed that feeding efficiency could improve by a tenth in the next twenty years. With this basis, there would be a need for a 33 to 40 per cent increase in total feed use by 1975. The total requirement for an increase in crop production will be in the magnitude of 28 to 36 per cent above the record 1956 crop. This information gives us the basis for looking at what will be needed in the future. The requirements can be summarized as follows: (1) By 1975 we will need an increase in crop production of around one third; and (2) by 1975 the need for livestock and livestock products will increase at least 40 per cent above the 1956 level.

If we accept these data as being as reasonable as any we can determine, then we face the problem of estimating how this increase in production can and will take place.

Fertilizer Use Will Rise With Farm Efficiency

We know that it is possible for farmers to produce a given amount of feed with different levels of input. They can use more fertilizer and less land, or more land, more labor and less fertilizer. Trends in agriculture production indicate that farmers are becoming more businesslike and more "managerial" in their attitude toward farming. I am confident that this trend will continue and that farms will become larger, more mechanized and more efficient. Therefore, farmers will be more interested in producing crops and livestock by the most efficient methods available. This in itself seems to provide a basis for saying that fertilizer consumption will increase as agriculture becomes more efficient. *Again, we are back to the question of how much will it increase.*

Using the average state recommendations, as best I could determine them, and based on the acres of the crops grown in seven southeastern states, it appears that there is need for 86 per cent more fertilizer than now is being used in that area. There are many subjective evaluations in these calculations. Essentially, I took the present level of fertilizer use as being



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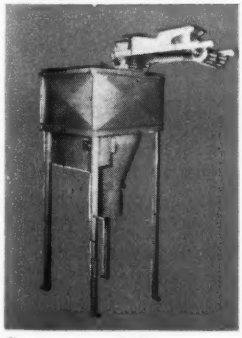

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that reported in Statistical Bulletin #216 of USDA.

These data were compared crop by crop, state by state, with average college recommendations. A guess was made as to what per cent of the total acres of crops should and would be fertilized and the difference between the average use and the recommended use was calculated. On this basis, we built up the need for the area crop by crop and state by state. This is a very time-consuming process and uses essentially a combination of estimating from soil tests and a statistical-mathematical model.

One of the unknowns in this type of calculation is illustrated by the acreage per pasture in many of the southeastern states. We know that the total acreage figure of land pastured (excluding woodland) in the seven states of about 24 million acres, represents a lot of rough mountain pasture, some eroded fields as well as some good pastures. To what extent does the mountain pasture represent a realistic potential for fertilizer use? At 40 cent beef, much of this land would probably be fertilized. At 16 cent beef, many of the fields that are hard to get to and where it is difficult to spread fertilizer will not be fertilized. With the help of informed persons (mainly USDA personnel) we guessed at how much of the pasture land in the seven states offered a possibility for use at recommended rates.

About all one can do, it seems to me, is to make a subjective evaluation, getting the best advice and knowledge from those familiar with the area, and temper figures accordingly. There is no magical formula that will permit us to evaluate all the many unknowns and intangibles that enter the picture.

With my Southern background I am taking the liberty of using cotton as an example to illustrate the techniques in estimating fertilizer potential. Dr. James T. Bonnen, Michigan State University, makes the following statement:

> "*Surpluses or at least a pressure of incipient overproduction will be with us through 1965 and probably longer (if the assumptions of our model hold true). This annual farm surplus reflects a structural imbalance between output and the consumption of agricultural products. The imbalance is chronic and fundamental in nature, not transitory.*"

In other words, the tendency to overproduce will be present in the foreseeable future and any look at the demand for fertilizer has to be against this background. I agree with Dr. Bonnen's conclusion. I think this has particular implications for cotton. The acreage of cotton in 1929 was about 44½ million acres. In 1929 cotton used an estimated 28 per cent of the total fertilizer consumed in the country. Production of cotton in 1929 was 14.8 million bales.

In 1954 the acreage of cotton had dropped to slightly under 20 million acres and cotton was using an estimated 9.9 per cent of the total fertilizer consumed in the country. Cotton was using over 2 million tons of fertilizer in both years, but the amount of plant food used per acre for cotton had increased from 1929 to 1954. The total production in 1954 was 13.7 million bales, almost as high as 1929. The 1957 acreage was 13.6 million; the production was about 11 million bales with an average yield of 388 pounds per acre.

Consumption of cotton is currently running around 12 million bales, including exports. Assuming an average yield of about 400 pounds per acre, the requirements for cotton could be met with present fertilization and other current practices on about 15 million acres. If farmers increase their application of fertilizer by about 50 pounds of plant food per acre, the yield would probably be increased to 500 pounds per acre on the average. The total requirements would then be met on about 12 million acres. The estimated reduction of cost with the reduced acreage would be about $170 million.

In other words, it is possible to meet the needs for cotton with essentially the present practices and using a million and a half more acres than was planned on in 1957. On the other hand, our requirements could be met with less acreage than was planted in 1957 with a small increase in average fertilizer use per acre.

In estimating the requirements for cotton fertilization in the future, the only way I know is to make a guess as to how fast farmers will accept improved fertilization and other practices to increase efficiency. It seems reasonable to expect an average yield of a bale per acre in the near future.

Present know-how makes at least 750 pounds of lint cotton per acre a reasonable goal for average yield throughout the country. Should this happen, then the total cotton requirements at the present level of consumption could be produced on about 8 million acres. *This would no doubt result in increased plant food consumption of the magnitude of a million tons of plant nutrients.*

Dr. Bonnen expects a slight decline in the per capita consumption of cotton between 1955 and 1965. He also expects an increase in yield of about 32 per cent or to around 550 pounds per acre. This gives him a projected acreage need in 1965 of around 11 million acres.

Use on Cotton Could Jump 72 per cent by 1965

My guess is that 11 million acres in 1965 is a reasonable one, taking into account an increase in population and estimated export needs. This will give between 12 and 13 million bales which should be enough to meet our requirements. The estimated increase above current levels of fertilizer use per acre for 11 million acres is 75 pounds of plant nutrients. This will mean an increase in fertilizer use on cotton of approximately 400,000 tons of plant food. Consumption of plant food on cotton in 1954 was about 572,000 tons. In other words, from 1954 to 1965 the amount of plant food being used on cotton could increase by about 72 per cent.

After securing such "guesstimates," it becomes

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A USDA drill is being used to conduct research on ways of placing plant food, including

BAND FERTILIZING

THE USDA experimental grassland drill was on display last month during the American Society of Agronomy meeting at Purdue. With this machine —designed to plant grasses, legumes and small grains in a prepared seedbed—it is possible to make broadcast or band seedings. Seed and fertilizer can be drilled together in a band (contact placement), or the fertilizer can be placed in a band under or to the side of the seed, or it can be broadcast.

The accurate control of fertilizing and seeding rates and placement make this drill a reliable tool for fertilizer placement research.

Richard F. Dudley, a USDA agricultural engineer at Beltsville, Md., reports that the accurate placement of seed in relation to fertilizer has received attention "only in recent years."

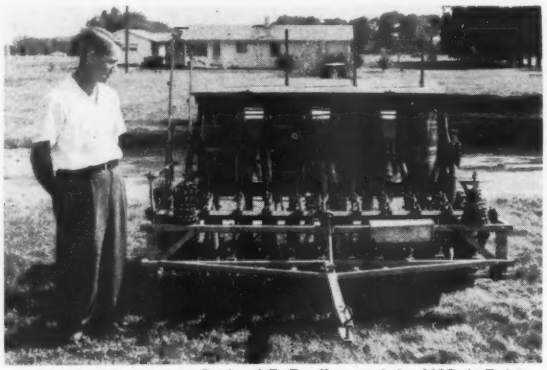
He says some results to be expected from band seeding and band fertilizing include:

- Less contact between fertilizer and soil, resulting in more fertilizer available to the young plant.
- Fertilizer placed one inch below the seed is readily available to the small roots of the seedling, which means emergence is faster and at a higher rate, seedlings are stronger with a lower mortality rate, seedling development is more rapid, weed competition is reduced and there are higher forage yields.
- Less seed is required for a satisfactory stand.
- More flexibility in time of planting, due to the faster development of the young seedling.
- It is good insurance—as protection against weather hazards, disruption of rotation or shortage of hay and pastures.

State agricultural experiment stations may request the use of the special drill, Dudley says. In 1951, two experiments were conducted in two states with one special drill. In 1954, ten experiments were conducted in eight states with two drills. In 1957, 17 experiments were conducted in 14 states with six drills.

Experiments to compare band and broadcast placement of seed and fertilizer were conducted in five northeastern states from 1954 to 1957. Band seeding has given quicker emergence, more rapid seedling development, better stands and higher yields. Results appear to be related to the basic field fertility level.

Some agronomists have recommended that one drill should be designed that can be used by farmers to plant and fertilize all their crops. This experimental drill could be a forerunner. ▲



Agricultural engineer Richard F. Dudley and the USDA F-64 experimental grassland drill. Component parts include Cole top-delivery hoppers for uniform metering and easy calibration, John Deere double-disc openers and an International seedbox.

POTENTIAL *(from page 28)*

purely a matter of judgment as to what will really happen. We can say that there is a need on the part of farmers to increase efficiency of production. This means, among other things, using more fertilizer. Assuming total production were kept within reasonable balance with demand, there is a present need to increase plant food use on cotton by at least 300,000 tons of nutrients. *The difficulty is developing a scheme which encourages efficiency in production without running into surplus problems.* Many of the considerations are social and political, rather than economic.

There obviously are numerous assumptions back of this sort of calculation. It is assumed that prices and cost will be such that the increase in fertilizer use will be profitable. It also assumes that no major break-throughs in technology relating to cotton production will occur. To have the most validity such a computation would need to be made state by state since the use of averages cover up any special situations, and can easily lead to wrong conclusions.

In looking at the future demand for fertilizer, we know we are in the midst of tremendous technological changes, both in the fertilizer industry and in agriculture. How accurately we can predict the future fertilizer needs depends on how accurately we can guess at what these changes will be and what their effects will be.

Using a combination of projection technique and the mathematical model, it appears that a realistic potential for plant food consumption in this country in 1965 is around 9 million tons of primary nutrients, assuming prices of farm products and the cost of inputs remains about the same as 1957. If there is an increase in agricultural production above that projected under normal conditions, the demand for plant food in 1965 could easily be as high as 10 million tons or higher. Should there be any slackening of demand for agricultural products, we probably will not use much over 7 to 8 million tons of plant food in 1965. ▲

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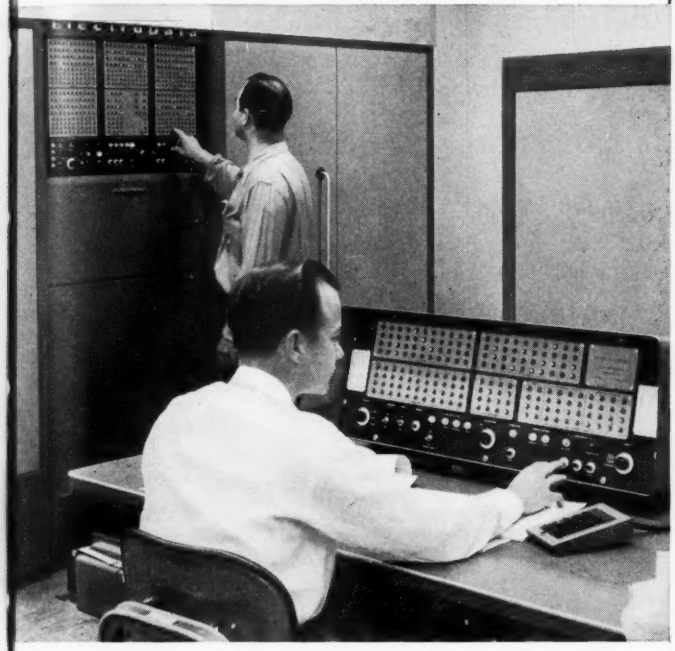

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- ***Super vs. rock phosphate in Michigan***
- ***Liquid vs. solid fertilizer on turfgrass***

Crop Response to Various Ammoniated Superphosphates

ORDINARY superphosphate (OSP) and concentrated superphosphate (CSP), unammoniated and ammoniated to various degrees, were evaluated in a series of greenhouse experiments with wheat, red clover and oats. Ammoniation decreased water solubility of the phosphorus in OSP from 70 to 14 per cent and in CSP from 89 to 55 per cent, chiefly because of reversion to dicalcium phosphate. With application in a band, yields of dry matter and of phosphorus were closely related to the amount of water-soluble phosphorus applied. Other than for pure dicalcium phosphate, granule size was of little importance with band application. With phosphates mixed throughout the soil, both water solubility and granule size of the phosphates greatly influenced yields. Response was poorer for a second than for the first crop after applying the phosphates. Response was also poorer with increasing time of reaction (3 to 6 months) of the phosphates with soil prior to cropping. Liming acid Hartsells fine sandy loam had relatively little effect on crop response to the various phosphates.

G. L. TERMAN, J. D. DEMENT AND L. B. CLEMENTS
Tennessee Valley Authority

Fertilizer Effects on Corn Composition and Yield

A STUDY was made of the effect of nitrogen and phosphorus fertilization on yield and nutrient composition of corn plants. The relationships between yield and plant nutrient composition were also evaluated. These data were collected from an irrigated experiment in North Dakota, using hybrid Nodak 301 corn during the years 1953 through 1957. Nitrogen and phosphorus analyses were made on corn grain and corn stover sampled at harvest time, and on leaves selected at time of pollination (August 6–12). In the presence of added phosphorus, yields of corn forage and grain were increased by rates of nitrogen up to 80 pounds per acre. In the presence of added nitrogen, phosphorus also increased production. Both nitrogen and phosphorus concentrations in corn leaves, grain and stover were increased by fertilization. The nitrogen and phosphorus contents of leaves sampled at pollination were highly correlated with yields, and also with total nutrient uptake at harvest. Partial regression analysis showed that leaf nitrogen was the dominant indicator of yield, but that leaf phosphorus was also important. The phosphorus content of the leaves was found to be related to the nitrogen content. Critical nitrogen levels were calculated from these data. Critical phosphorus levels were not clearly defined.

G. A. REICHMAN, D. L. GRUNES,
C. W. CARLSON AND J. ALESSI
USDA Agricultural Research Service

Source and Time of Nitrogen on Winter Rye Forage

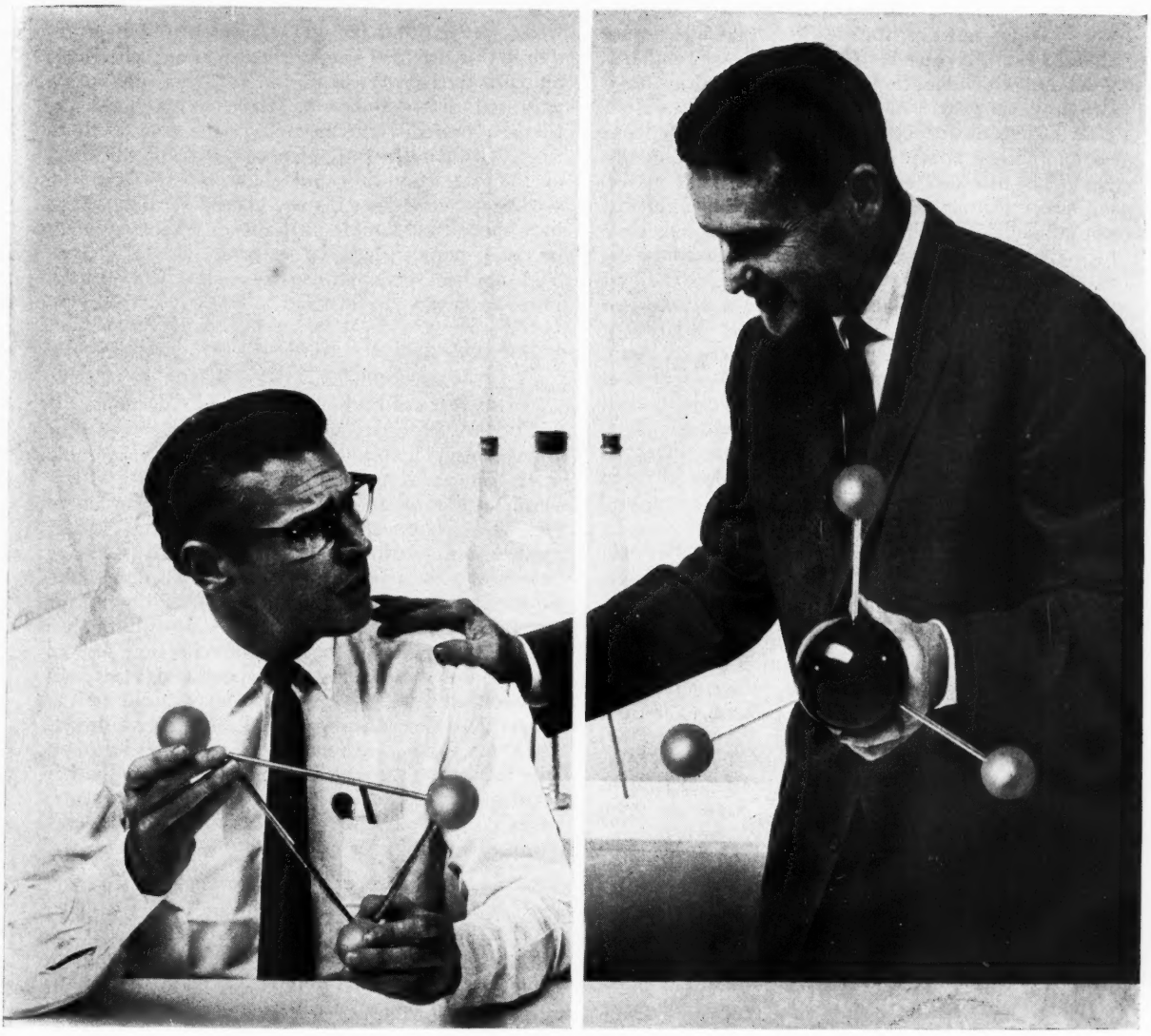
THE EFFECTIVENESS of five sources of nitrogen for winter rye forage production was compared in a three-year field experiment on Cecil sandy loam. Each source of nitrogen was applied at the rate of 120 pounds per acre by (1) all N at planting, and (2) one-half N at planting and one-half February 15. Ammonium nitrate, sodium nitrate, urea and ammonium sulfate were found to be equally effective as sources of N for rye forage. Calcium cyanamid was an inferior source of N producing approximately 500 pounds per acre less forage than the other fertilizers. Applying the N in split application resulted in approximately 300 pounds per acre more forage than applying all the N at planting. All sources of N responded similarly to split-application. Applying all the N at planting increased the forage production at the first two clippings an average of only 100 pounds per acre for all N sources as compared to the split application.

H. D. MORRIS AND J. E. JACKSON
University of Georgia

Nitrogen Effect on Yield, N-Uptake of Forage Crops

THE EFFECT of nitrogen fertilization rate upon the yield and N-uptake of grass and legume-grass mixtures was investigated in 126 field experiments during the period 1950–58. When all locations were averaged the yield response to nitrogen followed the Mitscherlich equation. A sigmoid response curve

Abstracts of papers presented at the American Society of Agronomy Meeting, August 4-8, Purdue University, Lafayette, Indiana.



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was obtained however for meadows that had a pure stand of timothy, quackgrass, bromegrass or orchardgrass and which had little or no legume in the stand the previous year. A convex yield curve was obtained when the meadow contained 10 to 20 per cent legume with a heavy stand of legume the previous year. The nitrogen fertilization of meadows containing heavy legume stands (40 per cent or more) was not studied. The nitrogen deficient grass sods were high in carbonaceous residues which increased the demand of the microorganisms for nitrogen. The first increment of nitrogen applied to the sod was used largely by the microorganisms and temporarily at least was not available for crop production. After the requirements of the microorganisms were satisfied additional increments of nitrogen resulted in marked yield increases of forage with a gradual decline in yield response as the rate of nitrogen fertilizer increased. Similar results were obtained when nitrogen fertilizer was applied to five simulated grass and legume-grass pastures.

W. K. Kennedy
Cornell University

Herbicides and Establishment of Forage Legumes

Small seeded forage legumes are peculiarly subject to competition from weeds during the establishment stage. Despite this fact, herbicides have been used only to a restricted extent because of limited selectivity with available materials. The introduction of the beta-oxidizing phenoxy butyric acid compounds gave renewed emphasis to weed control in new stands. The use of a broadleaf herbicide alone has proven unsatisfactory since grassy weeds become highly competitive. Several workers have obtained good control of both grassy and broadleaf weeds by the use of dalapon-2,4-D[B] mixtures. Marked differences in response among legume species must be recognized, both in the benefit from weed release and in response to specific chemicals. Birdsfoot trefoil establishment is particularly enhanced following weed release. Ladino clover is restricted while subject to competition but readily recovers due to its stoloniferous habit of growth. 2,4-D has been shown to be considerably less toxic to birdsfoot trefoil and Ladino clover than to other legumes and should not be dismissed for use on these species.

R. A. Peters
Storrs Agricultural Experiment Station

Evaluation of Herbicides for Pasture Renovation

Until recently, pastures were renovated with surface tillage equipment. Within the past 10 years attempts have been made to supplement tillage practices with herbicides as a means of making tillage easier and more completely eliminating the unwanted sod prior to reseeding. Of the more than 20 chemicals evaluated, dalapon, amino triazole and cacodylic acid have been the most promising. To be acceptable a chemical must be effective for a complete kill, leave no residue in the soil, be economical, easy to use and versatile with respect to season, species and condition of the pasture at the time of application. The degree of kill depends upon the rate of chemical employed, amount of top growth when sprayed and the species present. Tillage required for seedbed preparation without chemicals amounts to the equivalent of 15 to 20 diskings with a weighted disk. Following an effective herbicide, tillage required varies from 0 to the equivalent of 2 to 10 diskings depending upon the season, thickness of sod, soil condition and characteristics and the seeding practice anticipated. Weed seedlings have been more troublesome in the August seedings than in those made in late winter or spring. Cacodylic acid, applied the same day as seeding, was helpful in reducing this problem.

M. A. Sprague, A. H. Kates,
T. O. Evrard and R. J. Aldrich
Rutgers University

The Place of Herbicides in Seed Production

Control of weeds in seed crops to get weed seed free planting material is important. Considerable work has been done by the Oregon Agricultural Experiment Station to develop herbicides as an aid to supplement cultural practices such as cultivated row culture and hand roguing. The use of 2,4-D for broadleaf weed control in grasses has been supplemented by the use of IPC and CIPC in the fall for weedy annual grass control. Recently diuron has been used successfully for the removal of both annual grasses and broadleaves from perennial grass and legume seed crops. The gamma butyric acid derivative of 2,4-D has also been used for selective broadleaf weed control in annual and perennial legumes. The results of this research have been used rather widely by seed growers in the Pacific Northwest.

W. R. Furtick and D. O. Chilcote
Oregon State College

Residual Effects of Fall and Spring Nitrogen

Residual effects of both fall- and spring-applied nitrogen fertilizers were determined at five locations on soils having a wide range in texture. Rainfall, runoff and evaporation were measured in an attempt to calculate percolation. A large part of the nitrogen that was not used by the crop to which it was applied was carried over for long enough periods to be of importance to succeeding crops. There were wide variations in this residual effect with the season. This appeared to be related to both total rainfall and its distribution. As an average of 9-year location tests, nitrogen applied in the fall was about 60 per cent as effective as nitrogen applied later at the conventional time in the spring for corn production. Recovery of 100-pound spring applications of nitrogen by corn and several succeeding crops without additional nitrogen fertilization, amounted to 45 per cent, compared to 37 per cent recovery of the same rate of nitrogen applied the preceding fall.

Robert W. Pearson, C. E. Scarsbrook,
H. V. Jordan and Orus L. Bennett
USDA Agricultural Research Service and
Alabama Polytechnic Institute

Effect of Nitrogen On Water-Use Efficiency

The effect of nitrogen fertilization on water-use efficiency of cotton, corn, Sudangrass, Coastal Bermudagrass, Bahiagrass and Dallisgrass was determined under both irrigated and unirrigated conditions. Water-use efficiency for all crops was greatest

at the highest nitrogen rates and gradually decreased as the rate of nitrogen application was reduced. Although a considerable increase in yield was obtained by irrigating, in general, water-use efficiency was reduced as the soil moisture level was increased. A greater influence from nitrogen fertilization was obtained at a high soil moisture level than at a low soil moisture level. The total amount of water used was found to depend more upon the amount of available moisture in the soil than on plant species or rate of nitrogen. Average daily evapotranspiration rates ranged from about 0.10 inch for the unirrigated section to about 0.20 inch for the irrigated section. Data indicate that the most efficient water use is obtained where nitrogen is not limited.

Basil D. Doss and L. E. Ensminger
USDA Agricultural Research Service and
Alabama Polytechnic Institute

Fertilizer Placement for Small Grains

Fertilizer experiments involving placement for small grains were conducted in Michigan during the last three years. Considerable delay in emergence of wheat seedlings and a 40 per cent reduction in stand resulted when fertilizer containing 80 pounds or more of N-P_2O_5-K_2O was applied in contact with seed. This much reduction in stand did not reduce yields below those obtained without fertilizer. Still greater amounts of fertilizer, however, reduced stands to 20 per cent of those where fertilizer was not applied or where it was applied in bands separate from the seed. Such stand injury was followed by significantly reduced yields. Generally, yields were proportionally higher than was expected from the thin stands, probably due to tillering. Also, lodging held down the yields of the wheat where fertilizers were applied in bands separate from the seed. Varieties adapted to higher fertility levels are needed before full benefit may be obtained from side band placement. Experiments show that small grain rows may be more than 7 inches apart, perhaps as far as 11 inches. This would facilitate the mechanics of band placement. Oats emergence was delayed but stands and yields were not affected by contact applications of fertilizer.

R. L. Cook, J. R. Guttay, L. S. Robertson,
C. M. Hansen and H. M. Brown
Michigan Agricultural Experiment Station

Superphosphate vs. Rock Phosphate in Michigan

Superphosphate and rock phosphate were compared on corn, small grains and alfalfa in field experiments on limed and unlimed soils. The work was a part of the North Central Regional (NC 16) studies. Rock phosphate has not generally increased yields of corn or small grains. Alfalfa yields were generally increased by both forms of phosphate, but more by super than by rock phosphate. Soil tests made by extracting with 0.135N HCl show that after 7 years there is sufficient phosphate remaining as rock to raise the soil tests by 30 pounds an acre. This figure remained stable during 1956 and 1957, indicating that very little of the phosphorus was being removed by plants. Weak acids (0.018N acetic and 0.025N HCl) did not remove phosphorus from the rock phosphate. The weak reagents should be used in testing soils which have been treated with this form of phosphate. Plant-test data and early growth measurements furnished further evidence that young plants were able to pick up more phosphorus from super than from rock phosphate. This was true even where neither form of phosphate increased yields.

J. R. Guttay and R. L. Cook
Michigan Agricultural Experiment Station

Turfgrass Responses to Liquid and Solid Fertilizer

In an evaluation test of a liquid 12-8-4 fertilizer containing urea, ammonium nitrate, di-ammonium phosphate, potassium chloride and a detergent spreader, little difference in turfgrass responses was found between the liquid and a solid 12-8-4 fertilizer during a 2-year period. For the comparison, 3 rates of application, 8.3, 16.7 and 33.3 pounds of liquid or solid 12-8-4 per 1,000 feet, were used on one turf of average quality and one of below average quality. Color ratings, height at clipping, yield, and N, P and K levels indicated that beneficial responses lasted for a period of 1 to 3 weeks. These responses did not always appear immediately after fertilization and were related to the time and amount, but not the type, of fertilizer applied. Liquid 12-8-4 fertilizer was also applied to limed and unlimed bluegrass, bentgrass and red fescue plots at rates of 25.0, 31.1, 33.3 and 37.5 pounds per 1,000 square feet. These applications resulted in temporary, though severe, burning, especially of bentgrass. Changes in density and frequency of turfgrasses were related to the amount, not the type, of fertilizer used.

N. H. MacLeod, E. C. Roberts and
J. E. Steckel
Virginia Agricultural Experiment Station and
University of Massachusetts

Method for Measuring Short-term Nitrogen Absorption

The method previously reported for measuring short-term uptake of phosphorus and potassium by plants also is useful as a means of evaluating nitrogen fertilizers. Oats were grown in sand cultures without added nitrogen for 14 to 17 days. The exposed root mat with plants intact was then placed in contact with the soil or soil-fertilizer system. Nitrogen uptake from soluble nitrogen fertilizers was linear with time during growth periods of 1 to 7 days. Uptake increased linearly with nitrogen additions in the range 0 to 40 mg. nitrogen per 200 g. soil. Nitrogen uptake during 3- to 14-day growth periods was essentially the same from urea, nitrate and ammonium forms of nitrogen, but was much less from such compounds as urea-form. Recovery of added nitrogen from soluble sources by the plants varied from 61 to 93 per cent within 14 days, depending on rate of addition. Nitrogen additions did not result in plant growth response during a 7-day period. The method promises to be of value for preliminary evaluation of nitrogen fertilizers and as a means of following short-term changes in their availability in relation to soil properties.

Jack D. DeMent, George Stanford and
C. M. Hunt
Tennessee Valley Authority

How Would You Decide?

FC

A monthly roundup of day-to-day employee problems and how they were handled by management. Each incident is taken from a true-life grievance which went to arbitration. Names of the principals involved have been changed.

If An Employee Walks Out Can You Assume He Quit?

What Happened:

Phil Clark and Charlie Lang got into the habit of changing jobs in order to relieve the monotony. This was done without the knowledge of the foreman. When the supervisor found out what was going on, he told them to cut out the practice. The next day, he found that they were back at their old tricks, and he blew his top. In the ensuing dispute, the foreman told Clark and Lang to "do as you're told or stop working for this company."

The two men left their jobs, punched out, and went home. The next day they showed up for work. The foreman refused. "You walked off the job—you quit," he said.

"We didn't quit—we thought we were fired," they replied. They filed a grievance.

The company claimed that the men, by going home, had indicated that they had quit, and they were not entitled to their jobs back. Nor were they entitled to other benefits like accrued vacation, which they would get if they had been fired.

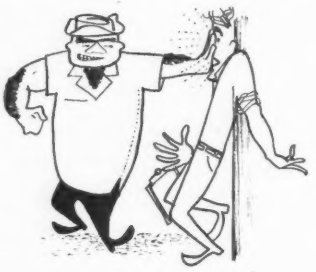
The men claimed that they were so upset by the supervisor's bawling-out that they thought he had fired them. Upon thinking it over that night, they decided that maybe they were not fired, and therefore they ought to come back to work.

Was The Company:
RIGHT ☐ WRONG ☐

What Arbitrator Clarence M. Updegraff ruled:

"These men were clearly in the wrong in changing jobs and could have been disciplined. But they did not 'quit' in the accepted sense of the term. Neither were they discharged. Because they walked off the job without permission, they are subject to discipline. I order reinstatement, but without back pay."

Can An Employee Be Fired For Shoving His Foreman?



What Happened:

Al Trask had a reputation for flying off the handle. That's just what he did when his supervisor came over and said: "Say, Al, I found some of these worksheets under your bench. What are you doing, hiding them?"

"Don't talk to me like that. Who do you think you are?" Al answered angrily. But that wasn't all. He shoved the foreman out of his way and went to his locker room. For this he was fired. Al cooled off, and took his case to arbitration. He told the arbitrator:

1. I was excited. I didn't mean anything. I've been around for ten years. This penalty is too severe.
2. If I had hit the foreman, I would never have brought up a grievance. I know that you should get fired for hitting a supervisor. But I just shoved—easy like. He was standing in my way. No one got hurt.

The company stood its ground. It said that "a hit or a shove" is the same thing. Supervisors don't have to take this kind of abuse from anybody. He stays fired.

Was The Company:
RIGHT ☐ WRONG ☐

What Arbitrator Mitchell M. Shipman ruled:

"One of the most heinous offenses that an employee can commit is that of physical assault on a co-employee. And where the employee assaulted is a member of supervision, there is involved not only the problem of employee safety and health, but also plant discipline and morale. The question of whether the worker in this case punched or pushed is unimportant. The degree of force or the measure of injury does not change the act. Pushing a foreman is as serious as hitting a foreman. The discharge is sustained."

If Others Have Been Excused, Can You Fire An Employee for Offense?

What Happened:

While making his rounds in a remote part of the building, the night foreman heard the gentle tinkle of a bell. It came from the room on his right. He tried the door—and it was locked. This was strange because that room, which contained all of the ventilating equipment, was not supposed to be shut. He knocked on the door. He heard a rustling sound from within. The ringing stopped. Then the lock was unbolted and a sleepy-eyed worker opened the door. He had his shoes off, and in the corner was a nice cozy blanket and pillow. He

was immediately fired for sleeping on the job.

But he was wide awake when he took his case to an arbitrator. He said: "Yes, I was sleeping but I don't deserve this kind of punishment. Last month 2 janitors were caught sleeping, and all they got was a 3-day layoff. Why discriminate against me?"

The company was not caught napping by this argument:

1. This man had a responsible job and he did not carry out that responsibility.
2. He probably slept all the time—witness the blanket and the alarm clock (which was set to ring 15 minutes before the end of his shift).
3. Sure we didn't fire the janitors, but look at the difference in the responsibility of the jobs. Besides, the janitors had finished all their work.

Was The Company:
RIGHT ☐ WRONG ☐

What Arbitrator Clarence M. Updegraff, Chairman, ruled:

"An employee sleeping on the job is subject to discipline. An employee who deliberately and with premeditation makes advance arrangements for sleeping deserves severe discipline. I cannot agree that the company's action in discharging this man was too severe."

Can You Make A Skilled Worker Do Other Jobs To Save Money?

What Happened:

Joe Venner was a carpenter, but because business was slowing down, his supervisor assigned him to help move some machinery around the plant. Joe obeyed but immediately filed a grievance. He said:

1. I'm a skilled man and should not be required to work outside my classification.
2. If there is a shortage of work in my trade, I should be given a choice—layoff or assignment to another trade. But the choice should be mine, not the company's.

Management disagreed completely:

1. If we are going to operate in the black we must be free to move men around.
2. Nothing in the contract prohibits the supervisor from shifting his people from one job to another as long as rates are maintained.
3. We don't want any prima donnas in our plant. Times are getting rough and we have to do what is best for the company.

Was The Company:
RIGHT ☐ WRONG ☐

What Arbitrator Harry H. Platt ruled:

"The company does not have the same right to transfer a skilled tradesman from one classification to another that it has in respect to employees in production classifications. In short, a tradesman should not be required to do work in a trade other than his own. If such an assignment is attempted because of a shortage of work in his trade, he may refuse it and take a layoff instead. In emergencies, however, the company may make assignments across trade lines."

When Can't You Discipline An Employee For Slowing Down On The Job?

What Happened:

Arthur Dorman was an experienced employee with some ten years' seniority. One day the supervisor transferred Dorman to another job in the department. This was a piece-work operation, and the standard was 166 pieces an hour. The first week, Dorman averaged only 78 pieces.

The supervisor felt that the employee was stalling, and decided to time-study the operation. The previous standard was found to be a fair one. Yet Dorman continued to produce below average. On two occasions he was warned. His reply was that he was working as fast as he could, but that the standard was too high. After another warning, Dorman was fired for carrying on a "deliberate and wilful slowdown."

He took his case to arbitration and argued:

1. I didn't slow down. I tried the best I could but couldn't make the standard. That's the company's fault.
2. Look at my record—ten years of work with the same company. Doesn't that count?

The company rested its case on circumstantial evidence gathered during the period in dispute. It brought out the testimony of the time-study engineer, and records of other employees on the same job who seemed to have no trouble meeting standard.

Was The Company:
RIGHT ☐ WRONG ☐

What Arbitrator Harry H. Platt ruled:

"An intentional slowdown of production is one of the most serious of industrial offenses. Because of its very nature, a charge of intentional slowdown is often difficult to prove by direct evidence: hence it may be established by circumstantial evidence. To sustain a charge of intentional slowdown, there must be convincing proof of deliberate and wilful acts restricting the rate of required output. While the failure of the aggrieved to achieve the rate of production attained during the time-study may suggest a resistance to the established standard, it is hardly convincing proof of the fact that an intentional slowdown was in progress. Nor can it be flatly stated that the failure of a pieceworker to make the objective earning rate, in and of itself, is conclusive evidence of a wilful restriction of production. The discharge was not for good cause. The employee, Arthur Dorman, shall be reinstated with full seniority and with back pay."

The ECONOMICS of Fertilizer Usage

Industry must organize a "simple, straightforward method of showing the farmer the economic value of fertilizing for top yields."

BY DR. VINCENT SAUCHELLI

"One thing I would like to see spelled out more specifically is that good crop production is the first prerequisite of a successful farmer. I was talking to an agricultural economist last week. He felt that the main problem with agricultural economists is that they do not realize the great importance of top crop yields."

The above quotation is from a letter to me by one of the ablest thinkers in the fertilizer industry. He put his finger on one of the most important factors in profitable farming that needs constant, repetitive emphasis. The importance of top crop yields lies primarily in the fact that only by such yields can a farmer enjoy a profit from his enterprise. Top crop yields mean a low crop unit cost of production. And to obtain such top yields the indispensable tool in modern farming is the prudent application of fertilizers.

The right kind and amount of plant nutrients needed to obtain top yields are governed by the particular crop, the selected field and the availability of the plant foods already in the soil as determined by a suitable soil test. Other factors, of course, are influential, such as the amount and kind of soil organic matter, soil moisture and structure, lime and secondary and trace elements.

Where Farmers Can Go

The farmer should have a good understanding of the plant nutrient requirements of each crop and learn how to supply those requirements most effectively. This may be a counsel of perfection. The recent NPFI survey of "Farmers' Attitudes Toward the Use of Fertilizer" revealed clearly that the average American farmer, operating 100 or more acres, does not understand the fundamentals of chemical fertilizers. With such limited knowledge and general lack of understanding about fertilizers the practice of selecting and applying the right kinds and amounts of fertilizers for each crop may be beyond his capabilities. The local county agent, fertilizer dealer, extension service worker, the farm press and fertilizer technical service men and salesmen must be relied upon as sources of information on top crop yields. These are the men the average farmer goes to for guidance and instruction.

Fear, Igorance Limit Use

Most farmers who are using fertilizers know that they do more or less what is expected of them: they "work". Many have the ready cash to invest in larger amounts of fertilizer than currently used, but lack the information and confidence to put on their crop land enough fertilizer to get the greatest total profit per acre—that is, top crop yields. Why is this? Fertilizers have been known and used for close to a century. The NPFI survey showed that farmers generally consider the use of fertilizers to be good but are very cautious in the amount they would use if they had plenty of money. Lack of adequate knowledge of how plants feed and how plant nutrients influence the quantity and quality of crops, fear that an excess of the amount now used would "burn out the crop" and other negative factors were revealed by that survey.

Undoubtedly many reasons exist why a farmer will buy fertilizer, but the all-impelling factor is the desire to earn more money. When he pays out $1.00 for fertilizer he believes his chances are good of making that $3.00 to $5.00 extra crop value on his investment that he has been led to expect.

We in the fertilizer industry will have to organize a simple, straightforward method of showing the farmer the economic value of fertilizing for top crop yields. This has been done in the case of most commercial vegetable crops, cotton, tobacco, citrus, sugar cane and a few others. These crops are generally well fertilized because of their high per-acre value. Apparently this has not yet been shown for pastures and grasslands. But even in the case of those special crops which are now fairly well fertilized, the records show that they are not uniformly fertilized at a high level. In general, the average rates of application in every state are far below those recommended by the local authorities for top crop yields and optimum returns. The average per-acre application of plant nutrients* for example, in the Southeastern states for the following specified crops has been remarkably low:

Corn, 15 lbs. of nitrogen, 13 lbs. of P_2O_5, 8 lbs. of K_2O.

Cotton, 15 lbs. of N,15 lbs. P_2O_5, 10 lbs. K_2O.

Rice, 11 lbs. of N, 8 lbs. P_2O_5, 4 lbs. K_2O.

Tobacco, 37 lbs. of N, 90 lbs. P_2O_5, 65 lbs. K_2O.

Program for Profit

Progress is being made however, even though it is slow. Our job as advisers to farmers is to impress upon them the economics of fertilizer usage: profit returns are highest when fertilizer applications follow experiment station recommendations and are combined with good soil management practices, seed of superior varieties, optimum plant populations, weed and pest control and liming. This program adapted *as nearly as possible to the farmer's specific needs* will spell "Profit."

**Figures given by Dr. W. E. Colwell (N. C. Expt. Station, 1953)*

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KETONA AGAIN EXPANDS ALABAMA CHEMICAL PLANT

The second expansion of its Ketona, Ala., chemical plant has been announced by Ketona Chemical Corp.

P. H. Neal, Ketona's president, said that facilities will be built to produce prilled ammonium nitrate and ammonium nitrate-limestone.

"This new plant," Neal said, "represents another 'first' for Ketona Chemical since it will be the first plant in the Southeast, and only the second in the United States, to produce the latter of these important fertilizer and industrial materials."

Ketona Chemical is jointly owned by Alabama By-Products Corp. and Hercules Powder Co.

Chemical & Industrial Corp. has been awarded the contract to design, engineer and construct the latest addition, which is expected to be completed early in 1959. Design capacity of the plant is 75 tons per day of finished product.

AP&CC SIX MONTHS REPORT: HIGHER SALES, LESS INCOME

Consolidated sales of American Potash & Chemical Corp. for the six months ended June 30, 1958, totaled $23,658,273 compared with sales of $21,767,946 for the same period a year ago, President Peter Colefax has announced.

Net income for the first half of 1958 amounted to $2,200,555, equal after preferred dividend requirements to 92 cents per share on 2,270,058 shares of common stock outstanding. Net income for the same period last year was $2,485,332, equal to $1.25 per share on the 1,905,619 Class A and common shares then outstanding.

The figures reflect operations of Lindsay Chemical Co. from January 1, 1958. Lindsay was merged into AP&CC May 1, 1958 and is now operated as a division of the company.

On July 23, the company's board of directors declared quarterly dividends of 25 cents a share on the common stock, $1 a share on the $4 Cumulative Preferred Stock, Series A, and $1.25 a share on the Special Preferred Stock. Dividends are payable Sept. 15 to stockholders of record Aug. 29.

HUBBARD-HALL BUYS CHEM-SALTS, INC.

The Hubbard-Hall Chemical Co., Waterbury, Conn., has announced the purchase of the majority interest in the firm of Chem-Salts, Inc., of Atlanta, Ga. formerly Metalsalts Chemicals, Inc., manufacturers of metallic chlorides and copper cyanide. Abner A. Towers, president of Metalsalts, will remain as president of the newly named firm, with Edward R. Jones, executive vice president of Hubbard-Hall, as vice president. Charles T. Kellogg, treasurer of Connecticut Chlorine Products, a wholly owned subsidiary of Hubbard-Hall, will be secretary and treasurer of Chem-Salts.

GBC CHEMICAL BUILDS DRY MIX PLANT IN IND.

A newly formed corporation, the G. B. C. Chemical Corp. of Indiana, announces it will erect a small dry mix fertilizer plant at Fairmount, Ind. Incorporators were C. R. Heileman, R. Hinds and H. Todd, all of Cincinnati, Ohio.

Earl Campbell, former Ohio district representative for Allied Chemical Co., will be president and general manager of the new firm. Heileman will act as secretary and treasurer.

The company is capitalized at $50,000.

COURT RULES MILLER CAN'T USE MONSANTO SECRETS

Charles M. Miller, an employee of Central Farmers Fertilizer Co., on July 29 was perpetually enjoined by the U. S. District Court at Salt Lake City, Utah from "appropriation, use or revelation" of any trade secrets and other information and data he unlawfully took while an employee of Monsanto Chemical Co.

Central Farmers is a Chicago cooperative with a plant under construction at Georgetown, Ida. The Monsanto property involved, consisting of blueprints, operating and cost data and other information, did not constitute the work product of Miller when he was employed by Monsanto.

The court also found that the F. C. Torkelson Co., Salt Lake engineering firm and a defendant in the case, had wrongfully and unlawfully used Monsanto trade secrets revealed by Miller, but it did not grant an injunction against that firm at this time. The court order, however, did provide that Monsanto may apply for an injunction against Torkelson at any time it should appear that the Torkelson firm or any of its employes are making use of the trade secrets and other data involved.

The ruling climaxes action begun by Monsanto in December, 1956, against Miller and the Torkelson firm. Central Farmers Fertilizer Co. is a defendant in a companion suit in the U. S. Federal District Court at Pocatello, Idaho. Monsanto officials indicated that they intend to proceed as soon as possible with this latter case.

The Utah case was heard in a month-long trial before Judge A. Sherman Christensen of the U. S. District Court here. At the end of the trial, the court's findings of fact and conclusions of law held that Miller, in violation of both his common law and contractual duties, deliberately acquired for future use over a period of more than a year while in Monsanto's employ, information subsequently revealed to the Torkelson firm and to Central Farmers.

The court found that the Torkelson firm made no inquiry

whatsoever prior to the commencement of the court action which would have shown that the information being used by Miller and disclosed by him to Torkelson was Monsanto's confidential trade secrets. The court's findings stated that in view of basic principles of ethics and of law, the Torkelson firm should have made certain about this.

The court stated that one of the primary and motivating purposes that Central Farmers had in the employment of Miller was to obtain through him confidential information of Monsanto's designs and experience in electric elemental phosphorus furnaces.

Miller or any agent, representative or employee acting under him, are forever prohibited in the decree from using any of the court specified trade secrets in connection with the design, construction, alteration, modification or operation of an elemental phosphorus furnace for Central Farmers at Georgetown or elsewhere.

Miller or any agents or employees are forever barred from consulting with the Torkelson firm on any of the trade secrets or information concerning Monsanto's Soda Springs, Idaho, plant, acquired by Miller in the confidential relationship of employer-employee.

A further provision of the injunction against Miller prohibits use by him of any other Monsanto trade secrets he unlawfully took but of which Monsanto did not learn prior to or during trial of the case.

The court retained jurisdiction in the case to make certain that the terms and conditions of the decree are carried out by Miller and the Torkelson firm.

The next legal step in the case will be the determination of damages. Costs already involved in the case are to be paid three-fourths by Miller and one-fourth by the Torkelson company.

U.S. RUBBER JOINS IN NEW ITALIAN COMPANY

United States Rubber Co. and the Rumianca Co. of Turin, Italy, have announced they will jointly form a new company in Italy to manufacture and sell a line of chemical products developed and manufactured by the rubber company's Naugatuck Chemical Div.

With headquarters in Turin and a manufacturing plant in Borgaro Torinese, Naugatuck-Rumianca, S.p.a. will make and sell a group of agricultural chemicals, chemical specialties, and accelerators and antioxidants for the rubber industry.

Until the plant is built, the new company will import and sell Naugatuck Chemical products in Italy. The Italian plant's technical personnel will be trained at the chemical division's main plant at Naugatuck, Conn.

NEW CORPORATIONS

India Phosphatic Fertilizers Ltd., 500 Fifth Avenue, New York City, has been granted a charter of incorporation. Directors are Mary P. Smith, Lawrence Holzman and Warren R. Dwyer, all of 14 Wall St., New York City.

IMC MOVES TO SKOKIE ADMINISTRATIVE CENTER

New address for International Minerals & Chemical Corp. is Old Orchard Road, Skokie, Illinois.

Located 17 miles from downtown Chicago on a 20-acre wooded site, the administrative center is headquarters for all divisions of the company.

ARMOUR & CO. ADDS TO AMMONIA FACILITIES

Armour & Co.'s Ammonia Div. has opened new anhydrous ammonia filling plants at East Liverpool, Ohio, Los Angeles and Oakland, Calif. Bulk tank facilities also will be included at Los Angeles and Liverpool.

MEXICO'S FARMERS 'WOOED' TO FERTILIZERS

By Emil Zubryn

The Mexican government has succeeded in wooing the rural middle class farmers to use of fertilizers.

In nine years of intensive effort, production of fertilizers (chemical) has quadrupled, according to statistics released by Guanos y Fertilizantes de Mexico, chief Mexican producer.

Back in 1949, production for the firm was 49,000 tons annually. Today production is around 196,000 tons.

The production increase has made possible a reduction from 950 pesos ($76) a ton to 650 pesos ($52), the current quotation.

Ferrer Galvan, head of the firm, announced at its 15th anniversary, celebrated in June, that its new Coatzacoalcos plant will be operating within a few months. This unit will become part of the four plants now functioning in Guadalajara, Cuautitlan, the Federal District and San Luis Potasi.

Use of fertilizers has been reflected in better per-acre yields. And the middle class farmers have been thoroughly convinced, and won over.

Not so easy is the problem of the lower segments of farming communities. The *campesinos* (peasant farmers) and Indians who still resist innovations, use their age-old ways, including the use of wooden plows in more isolated communities.

The Mexican government plans to get after this segment of farm production in the next six years, under the administration of President Adolfo Lopez Mateos, who takes office this coming December. The approach will be the practical-results method, showing how the earth produces more, and thus makes it possible for the small farmer (working an average of only 2-½ acres) to also make a decent living and improve his standards of life.

With Mexican production of fertilizers still far behind actual needs, Mexico will continue the policy of permitting imports. But the long term view is to rely on nationally produced fertilizers once production levels up to demand.

FARM CHEMICALS People

Allied Chemical Corp. William L. Machmer, Jr., has been appointed director of purchases for Allied Chemical's General Chemical Div.

American Potash Institute. Dr. S. E. Younts, former research assistant professor of soils at the University of Maryland, has joined the institute as agronomist for the eastern region serving the area from Virginia to Maine. He will work out of Washington, D.C.

American Potash & Chemical Corp. As a result of the recent merger of Lindsay Chemical Co. with AP&CC, three major personnel promotions have been announced: George T. Deck was named general manager of the renamed Lindsay Chemical Div. at West Chicago, Ill.; Russell S. Sunderlin, plant manager of AP&CC's Los Angeles Plant, was named to succeed Deck as plant manager of the company's subsidiaries, American Lithium Chemicals, Inc. and San Antonio Chemicals, Inc., both at San Antonio, Tex.; and Harold Mazza, research manager at the Los Angeles facility, was appointed plant manager.

Chemical Institute of Canada. D. W. Emmerson has been appointed editor of the institute's news-technical journal, *Chemistry in Canada*.

Climax Molybdenum Co. Dr. E. C. Herrick has been appointed chemical research supervisor for the Detroit research laboratory of Climax Molybdenum Co. of Michigan. Herrick has been engaged in chemical research for Houdry Process Corp., American Viscose Co., E. I. duPont de Nemours & Co. and the Office of Naval Research at Massachusetts Institute of Technology.

Dixon Chemical & Research and Dixon Chemical Industries have created a new division, Dixon International, to develop and extend the company's overseas sales and imports.

Millers

Val J. Millers has been appointed vice president and general manager of the new division, which has its offices at 1260 Broad St., Bloomfield, N. J.

DuPont Co., Polychemicals Dept. Dr. John S. Beekley becomes administrative assistant to the department general management. He will retire late next year. Dr. Frank C. McGrew, assistant director of the department's Research Div., was named director, succeeding Beekley.

J. B. Hill Co., div. of Balfour, Guthrie & Co. Erwin H. Klaus joins the firm to "build an integrated marketing program." He had been general manager of Ravel Bros., Inc. and marketing director of Northrup, King & Co.

Klaus

International Minerals & Chemical Corp. Norman M. Johnson has been appointed supervisor of sales services in the Marketing Div. He will develop sales incentive and compensation programs, allot quotas and territories and initiate sales control systems.

Vergne

Appointment of Luis J. Vergne as sales manager—Latin America, for the Phosphate Minerals Div. was announced by the company. Vergne joined IMC in March, 1957 after four years in sales and traffic with Transcontinental Import Export Corp.

Hermes O. Grant has been named a project engineer at IMC's Bonnie chemical plant near Bartow, Fla.

Kingsbury & Co. William N. Brinson, 51, Indianapolis plant superintendent, died of a heart attack on Aug. 2. Before joining Kingsbury in 1955 he was plant superintendent for American Agricultural Chemical Co., Michigan Fertilizer Co. and Naco Fertilizer Co.

Minerals & Chemical Corp. of America. James Deshler II has resumed full status with the company and has been elected chairman of the board of directors.

National Agricultural Chemicals Association. Appointment of Denis Hayley as director of information has been announced by Lea S. Hitchner, executive secretary. Before going to NAC, he had been product manager for a unit of Diamond Alkali Co.

Hayley

A native of England, Hayley emigrated to the United States in 1928. He started his career as a salesman for Tobacco By-Products and Chemical Corp. which later became a division of Virginia-Carolina Chemical Corp. and, more recently, a unit of Diamond Alkali Co.

National Distillers & Chemical Corp. John E. Bierwirth, president since 1949, has been elected chairman of the board. He is succeeded as president by Roy F. Coppedge, Jr., an executive vice president.

Shell Chemical Corp. Jack A. Horner, secretary of Shell Oil Co. and a vice president of Shell Development Co., has been named secretary of Shell Chemical. He succeeds George E. Brewer, who has retired.

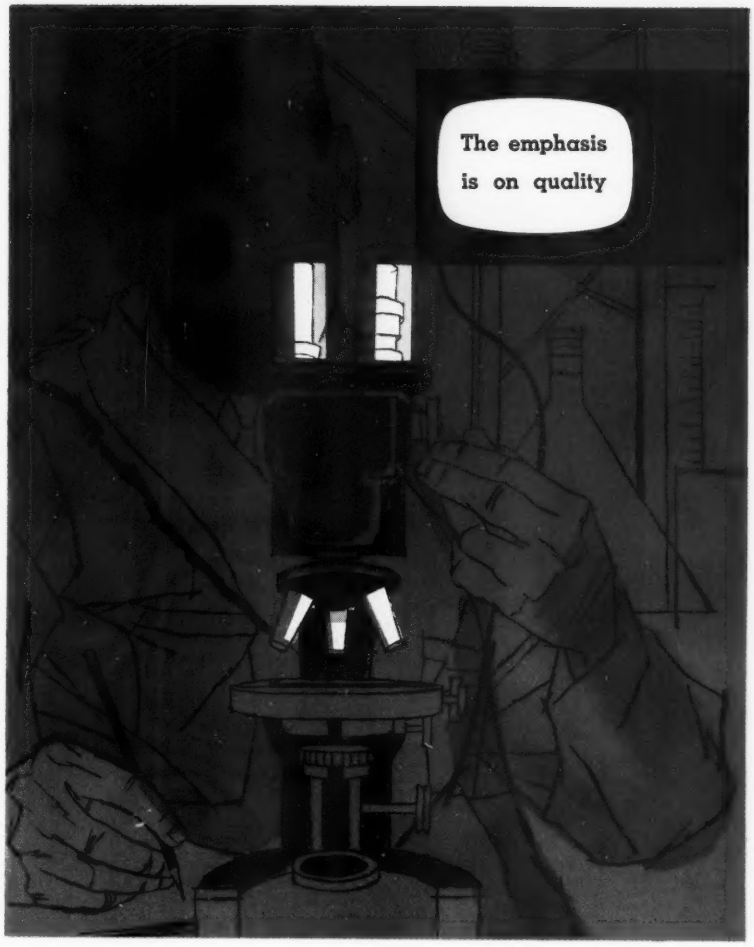
Smith-Douglass Co. Walter F. Bram replaces Russell Spivey as manager of raw material procurement, wholesale and export sales. Bram, who went to Smith-Douglass in 1954, has been assistant general traffic manager. Spivey resigned on Aug. 1.

Swift & Co., Agricultural Chemical Div. has appointed H. C. Huffman as head of its Procurement Dept., succeeding B. W. Guess, who has accepted another position. Huffman will be responsible for purchase of plant food raw materials. He also will work with H. P. Gould, manager of the Bartow, Fla., phosphate center in the sale of phosphate rock and triple superphosphate.

Huffman

The Texas Co. Langbourne M. Williams, chairman and president of Freeport Sulphur Co., has been elected a director of The Texas Co. He also is a director of the B. F. Goodrich Co.

Union Carbide Chemicals Co., Div. of Union Carbide Corp. After a tour of active duty with the U. S. Army, Hugh Jones has returned to the White Plains, N. Y., Office of Crag Agricultural Chemicals. He is working primarily on the development of Crag Sevin, Carbide's new insecticide.



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AGRONOMISTS MEET, ELECT NEW OFFICERS

The American Society of Agronomy elected Dr. J. B. Peterson, head of the Department of Agronomy, Purdue University, president at its annual meeting August 4–8 at Purdue University, Lafayette, Ind. Peterson succeeds Dr. W. M. Myers, who is head of the Department of Agronomy and Plant Genetics at the University of Minnesota.

Dr. George Sprague, USDA, was named vice chairman, and L. G. Monthey was re-elected secretary-treasurer.

Dr. B. A. Krantz, University of California, was elected chairman of the **National Joint Committee on Fertilizer Application,** and Walter Hulburt, USDA, vice chairman and program chairman of the committee.

Div. IV—Soil Fertility, is now headed by Dr. Gaylord Volk, University of Florida, chairman, and Dr. B. A. Krantz, University of California, vice chairman and program chairman.

Members of **Div. IVb—Plant Nutrients,** named Myron Keim of Virginia-Carolina Chemical Corp. chairman and Dr. William Bishop, University of Tennessee, vice chairman and program chairman.

Dr. M. L. Peterson, of the University of California, was elected president of the **Crop Science Society of America,** and Dr. Howard Sprague of Pennsylvania State University, vice president of the society.

Newly elected president of the **Soil Science Society of America** is Guy D. Smith of the Soil Conservation Service. Vice president is Dr. Walter Fitts, of North Carolina State College.

Dr. W. H. Garman, northeast regional director and chief agronomist for the National Plant Food Institute, was elected to the ASA board of directors. He also served on the committee which selected Fellows of the ASA. This year Dr. H. B. Mann, president of the American Potash Institute, was named a Fellow of the Society.

NFSA MEETING THEME: PLANNING FOR PROFITS

Nov. 16–18 the National Fertilizer Solutions Association will convene at the Netherland Hilton Hotel in Cincinnati, Ohio, President Richard Cecil has announced.

"Planning for Profits" is the theme of this year's convention, which promises to draw a larger attendance than the 350 registered last year.

The dealer's role in fertilizer sales for increased profits and sales planning for seasonal work will be discussed at the opening session on Monday, Nov. 17.

Tuesday morning, research work being carried on in the area of acceptance of new ideas by farmers will be presented, and a panel discussion is planned for the afternoon session following the general convention theme. Production and Inventory Control, Production Equipment, Application Equipment and Standardization will be covered.

Two floors of conference rooms have been reserved at the hotel, so that association members can visit with suppliers.

The Convention Planning Committee includes Chairman William B. Parrish, Auburn, Ill.; E. E. Crouse, NFSA executive vice president; Carl Schumacher, Monsanto Chemical Co.; John L. Wilson, Semo Liquid Fertilizers, Inc. and Ernest M. Harper, Allied Chemical Corp.

NPFI MIDWEST ADVISORS PLAN YEAR'S ACTIVITIES

Members of the Midwest Regional Advisory Committee of the National Plant Food Institute reviewed plans for expanded educational activities and approved the proposed budget for the year ending June 30, 1959, at a meeting July 22 at the Builders Club in Chicago. NPFI President R. E. Bennett, who also is chairman of the regional committee, presided.

Among projects approved by the committee were:

County-wide projects to measure the impact of soil testing and fertilizer demonstrations on the use of fertilizer and the attitudes of people toward the use of fertilizer.

Grants-in-aid for fertilizer research projects in Indiana, Kentucky and Michigan; also support for fertilizer demonstrations in Wisconsin.

Funds for an NPFI scholarship program in seven Midwestern states.

Continuance of the educational news service to 1,700 daily and weekly newspapers and 375 radio and TV stations in the region.

Printing and production of crop potential wall charts and check lists for four more states to supplement the program already under way in Illinois and Wisconsin.

Cooperative projects with state banking associations in 13 midwestern states.

Expansion of the February joint meeting of college agronomists and 4-H Club project leaders in the 13 states. Purpose is to strengthen the soils and fertility aspects of the 4-H Club projects in the area.

Attending the meeting were W. R. Allstetter, NPFI vice president; R. E. Bennett; Z. H. Beers, NPFI Midwest Regional Director; Merle Blue, Consumers Cooperative Association; R. G. Fitzgerald, Smith-Douglass Co.; Frank Nelson, Rath Packing Co.; A. C. Norris, V. W. Norris & Son; E. T. Potterton, International Minerals and Chemical Corp.; and W. W. Venable, Cornland Manufacturing Corp.

More news of Associations and Meetings appears on pages 51 and 52.

ON TARGET
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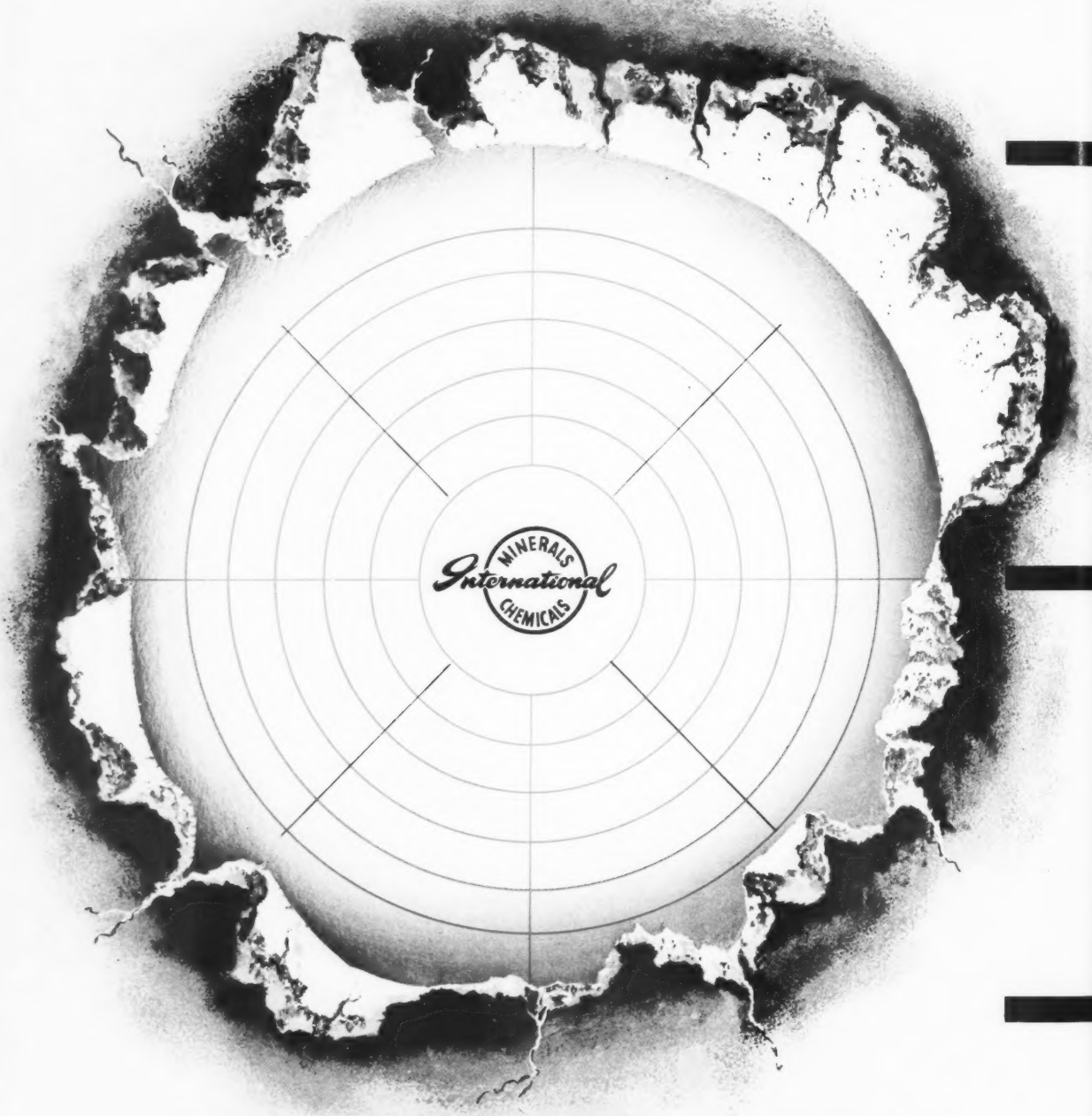
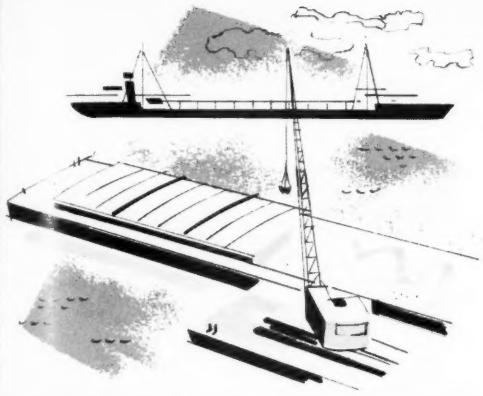
triple super service aimed for on-the-move fertilizer manufacturers



ON TARGET . . . your International Minerals' sales representative with the triple facts of phosphorus . . . International Minerals' triple superphosphate with guaranteed minimum 46% APA, consistently high analysis that aids in formulation—and in the texture you want.

But even more, your IMC man is on target with an entire program of service and built-in benefits that extend from in-plant techniques to in-field promotion. He's on your staff, backed by the full impact of International experience and skill.

For details write or wire International Minerals, Phosphate Chemicals Division, Administrative Center, Skokie, Ill



International establishes new standards of service in transportation . . . pioneered inland water route shipping, rolling warehouse program and super-speed on-site warehousing to meet peak load ordering with cash savings for you.

International's research continually works for you — develops phosphate products with superior quality . . . a never-ending search for pure, high analysis—the texture and mixing characteristics consistent with your needs and profit structure.

International puts years of marketing and promotional experience on your staff . . . helps you in every phase of the selling plan —from analyzing competitive situations to stimulating men, meetings and merchandising.

Experienced technicians bring practical solutions to production and formulation problems . . . every International Minerals man—scientific, technical or service—is on tap to give you on-location assistance at the cost of a call.

3 triples by International

RUN-OF-PILE — International's fine-textured Triple provides uniform particle size, even density and proper moisture level that lets you ammoniate at higher rates and temperatures.

COARSE — International's coarse-textured Triple gives same excellent ammoniation batch after batch . . . promotes desirable agglomeration.

GRANULAR — International's new granular Triple is non-crumbling and free-flowing; makes granulation easier. Sponge-like structure facilitates ammoniation.

Whether your plant operations calls for a fine, coarse or granular texture, International's Triple Superphosphate has it . . . to solve even the toughest formulation problems, and help you make the most of production and product. And backing up this 3-way texture selection is a host of built-in extras that help you "design" a superior finished product. There's guaranteed 46% APA — International's consistent, high analysis that reduces unit-delivered cost. Extra-long chemical reaction time teamed with *natural curing* and supported with physical characteristics that make storing and handling easy. Desirable physical and chemical properties also help you hold down reversion problems, contribute to lower production costs. Your International representative has all of the facts. See him soon.

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phosphoric acid

cuts corners on cost, keeps high analysis grades consistently on control

International's wet-process phosphoric acid works wonders where formulation costs are out of line . . . keeps high grades on the low side of cost control. Specifications: 53-55% P_2O_5; suspended solids, 2.5% by weight, max.; specific gravity (60° F) 1.70-1.75. And International's dependable fleet of rubber-lined tank cars puts rush shipments plant-side quickly to keep peak season schedules humming. And if you need technical assistance with production or planning installations, International Minerals' experienced and skilled technicians are on tap for on-the-spot trouble shooting.

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Phosphate Chemicals Division

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois

READER SERVICE

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FREE INFORMATION to help you solve fertilizer, pesticide problems

Chemicals

226—DELNAV MITICIDE

Hercules Powder Co.'s Delnav has received a label for use as a miticide on cotton, certain ornamentals and nonbearing citrus. Chemically, Delnav is 2,3-p-dioxanedithiol-bis-(O, O-diethylphosphorodithioate) and related compounds. It is available as an emulsion concentrate and is said to be compatible with all commonly used insecticides and fungicides. More specific data can be obtained by

CIRCLING 226 ON SERVICE CARD

227—S-R NUTRONITE

Smith-Rowland Co. suggests you add Nutronite, the "quality, natural organic supplement" to your chemical plant foods. For your lawn and garden fertilizer line, you can bag the straight material. Nutronite bags and merchandising aids are available. For information,

CIRCLE 227 ON SERVICE CARD

228—EMMI FUNGICIDE

An information manual on EMMI is available from Velsicol Chemical Corp., maker of the eradicative and protective fungicide. Used for several years as a protective dip for gladiolus corms, the chemical has now been granted a label for use with heptachlor for small grain treatment. For the information manual containing test data and additional information

CIRCLE 228 ON SERVICE CARD

How to use the

READER SERVICE CARD

- **Circle number of literature you want**
- **Print or type your name, position, company and address,**
- **Clip and mail the Service Card.**

229—DU PONT UAL-S

Two efficient forms of nitrogen are combined with ammonium sulfate in DuPont's UAL-S, the company reports. UAL-S is said to be non-corrosive to fertilizer manufacturing equipment, and it's safe—handles at moderate pressure, and there's no danger of flash fires. Regular mixtures cure well with UAL-S, are free flowing and resist caking, while in granular mixtures, UAL-S helps produce good yields of hard, round, firm granules that store and distribute well, DuPont says. They have complete information on the solution available.

CIRCLE 229 ON SERVICE CARD

230—FLUORIDES FROM UNITED HECKATHORN

Information is available from United-Heckathorn on the fluorides which it can now supply—cryolite, ammonium bifluoride, ammonium fluoride, sodium fluoride and aluminum fluoride. They'll be happy to send it to you. Just

CIRCLE 230 ON SERVICE CARD

231—6 LB. CONCENTRATES FOR CONTRACT SPRAYERS

Custom applicators can reap many benefits from its six-pound formulations of low-volatile 2-Ethyl Hexyl Esters of 2,4-D and 2,4,5-T, according to Diamond Alkali Co. —they cost less than standard formulations on an acid equivalent basis, reduce on-the-job handling, and save truck space. They can be mixed with water for an emulsion; with straight oil for an oil spray; or with a combination of oil and water. Complete information will be mailed to you if you

CIRCLE 231 ON SERVICE CARD

Process Equipt.

232—"W" DRIVE MAINTENANCE MANUAL

A 20-page manual containing installation, operation and maintenance instructions for gear drives of the "W" type now is available from the Pfaudler Co. Pfaudler says its Type "W" gear drive is a compact, quiet operating unit adaptable to a wide variety of agitated reactions because of its extended speed and power range. The bulletin contains engineering data on the "W" Drive itself, including dimensions, weights and rated capacities of all models. Detail drawings and parts lists of each model are included. Detailed instructions for dismantling the drive when equipped with either rotary seal or stuffing box are given, along with complete maintenance and lubrication instructions. Copies may by obtained by

CIRCLING 232 ON SERVICE CARD

233—MAGNETIC FLOWMETER SPECIFICATIONS

A new 4 page technical bulletin just issued by Fischer & Porter Co. describes the "obstructionless" magnetic flowmeter. It uses the principle of electromagnetic induction to produce an a-c signal which is directly proportional to flow rate. A free copy is yours by

CIRCLING 233 ON SERVICE CARD

234—HERCULES MILL

For uniform grinding of limestone, phosphate rock, etc. from 20 to 325 mesh, Bradley Pulverizer Co. says its Pneumatic Hercules Mill is the one to use. Its durable, non-clogging vibratory feeder is said to practically eliminate manual feeding and allows continuous operation of the mill at its maximum capacity. All grinding parts are easily accessible, and both grinding die ring and roll assemblies can be removed without dismantling the mill. For a catalog giving complete information

CIRCLE 234 ON SERVICE CARD

235—BRIDGE BREAKER

A new type of vibrator to break bridging of materials in storage bins, supply ducts and containers has been developed by Thayer Scale Corp. While vibratory means are employed, Thayer says the vibration is not applied directly to the side walls of the hopper or duct, but rather to screens which are inserted within the chamber and extend downward to the lower opening or discharge outlet. The bridge breaker can be furnished in varying sizes and shapes to suit existing hoppers and ducts. For details,

CIRCLE 235 ON SERVICE CARD

236—PULLEY BULLETIN

Continental Gin Company describes its welded steel pulleys in a new bulletin. They are furnished with "Taper-Lock" hubs and bushings to give the equivalent of a shrunk-on fit while permitting easy assembly and disassembly. Welded steel construction is said to combine maximum strength with minimum weight, and also excludes dirt and water. For your copy of the bulletin

CIRCLE 236 ON SERVICE CARD

237—STOP LEAKAGE WITH TIGHT-LIP BUCKETS

The proper application of a Blaw-Knox Bucket with tight fitting lips can prevent costly contamination caused by the leakage of granular fines, according to Blaw-Knox Company. Tight-fitting cast alloy steel lips are made especially for the handling of granular bulk chemicals and fertilizers, B-K says. To get complete information on the wide range of buckets available for chemical and fertilizer service,

CIRCLE 237 ON SERVICE CARD

238—RAYMOND MILLS FOR INSECTICIDES

The whizzer-equipped roller mill, an all-purpose large capacity machine, excels in sulfur grinding as well as in the production of organic concentrate formulations and all standard insecticide diluents, according to Combustion Engineering, Inc.'s Raymond Div. The company's vertical mill is said to be a compact unit designed for operating efficiency in the upper fineness range of 90 per cent to 95 per cent passing 325 mesh or higher in the subsieve sizes. There's more information in the Raymond Insecticide Bulletin, yours by

CIRCLING 238 ON SERVICE CARD

Materials Handling

239—PORTABLE BAGGING SCALE

The E-50 portable bagging scale designed for either power or gravity feed is described and illustrated in a new, two-color product data sheet now available from Richardson Scale Co. The E-50's design, construction and housing are discussed along with specifications and a line drawing showing dimensions. For a copy,

CIRCLE 239 ON SERVICE CARD

240—H-25 PAYLOADER

Descriptive literature and specifications on the new H-25 Payloader is available from The Frank G. Hough Co. It is the first rubber-tired, front-end loader with a rated capacity of 2,500 lbs., and has new design features which are expected to establish new standards of production and ease of operation, Hough states. Offered with a choice of gasoline, diesel or LPG power, the H-25 provides a bucket tip-back of 40 degrees at ground level. For details, obtain a copy of the literature by

CIRCLING 240 ON SERVICE CARD

241—FERTILIZER EQUIPMENT BULLETIN

Bagging and shipping equipment for the fertilizer industry is the subject of a new bulletin from K. E. Savage Co. Described are a shipping mill for bagging large volume of fertilizer, sewing machine stand, horizontal and inclined belt conveyors, and truck loading conveyors. Savage Co. will send you a copy if you

CIRCLE 241 ON SERVICE CARD

Packaging

242—NEW BAGCLOSER

International Paper Co. says its new bagcloser has the longest conveyor—9'9", an automatic stitcher head controlled by bag passage and it is fast. Bags from 14½" to 30" can be handled. The standard model is wired to Nema 4 specs. For full details on the precision-engineered Bagcloser 171,

CIRCLE 242 ON SERVICE CARD

243—ROTOMATIC PACKER

Raymond Bag Corp. says its Rotomatic Packer is fully automatic, all-mechanical and requires no outside source of power such as electricity or compressed air. It combines gravity operation with the even balance scale principle that delivers simplicity of operation, accurate weights and high rate of production, the company reports. Engineering, operation and installation details are available. Just

CIRCLE 243 ON SERVICE CARD

Miscellaneous

244—SAFETY BUNG

A free bulletin describes OPW Corp.'s safety bung, designed to protect against the explosion of volatile liquids in drums and storage. The bulletin includes application information, cut-away drawings and complete engineering information. OPW says safety bungs are widely used in the process industries and wherever hazardous liquids are stored. A copy will be put in the mail if you

CIRCLE 244 ON SERVICE CARD

245—PLASTIC EQUIPMENT BULLETIN

A bulletin to aid in the selection of the right plastic for each chemical corrosion problem has been issued by Haveg Industries, Inc. Such fields as the physical properties, chemical resistance, and typical equipment applications of phenolic, furane, polyvinyl chloride, polyester glass and tetrafluorothylene plastics are covered concisely and thoroughly with tables, pictures, diagrams and descriptions. To obtain a copy

CIRCLE 245 ON SERVICE CARD

246—NEW FEATURE ON FERT. SPREADER

Lube-impregnated chain drive is a new feature on the K-5 Lime and Fertilizer Spreader. Its advantages: greater corrosion resistance, and virtual elimination of chain "freezing," says Baughman Manufacturing Co. The spreader body has 40,000 lb. test malleable block chain and reinforced top edge, extended side jacks and internal bracing for full body support. For an illustrated bulletin

CIRCLE 246 ON SERVICE CARD

247—NEW SWATHMASTER

A Swathmaster-equipped airplane can lay a full and even swath at 1 gallon per acre and, with a simple resetting of the pilot control, put 180 gallons per acre on the next job, according to Transland Aircraft. The Swathmaster is a corrosion-resistant stainless steel, airfoil-like structure. It completely eliminates pumps, valves, booms, nozzles and special spreaders, the company reports, and has no adverse effect on the flight performance of the airplane. Complete description, features and installation details as well as prices are included in a brochure.

CIRCLE 247 ON SERVICE CARD

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248—Tote Rentals
249—Conveyor Scale
250—Midgie Labeler
251—Drum Cover
252—Plastic Bags
253—Flomax Pump
254—Hanson Tank
255—Lined Pails
256—Lift Truck Attachment

FARM CHEMICALS

Associations & Meetings

CONFERENCE ON CHEMICAL CONTROL PROBLEMS OCT. 16

A Conference on Chemical Control Problems, sponsored by the National Plant Food Institute, will be held on October 16 in the Shoreham Hotel's Park Room, Washington, D. C.

Dr. Vincent Sauchelli, chairman of NPFI's Chemical Control Committee, said that the audience will be encouraged to participate in constructive discussion of each presentation.

AGENDA

9:30 a.m.—Meeting called to order.
Introductory Remarks—Dr. Sauchelli.
"Use of Statistical Methods in Analytical Chemistry"—John Mandel, U. S. Bureau of Standards.
"Proposed Reorganization of Magruder Sample Work-Design of Experiment"—E. Glocker, Davison Chemical Co. Research Laboratory.
"The Importance of an Accurate Determination of Moisture in Fertilizers" C. H. Perrin, Research Chemist, Canada Packers Ltd. and W. L. Hill, USDA.

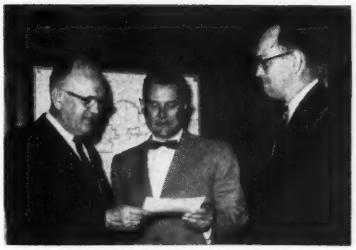
1:30 p.m.
"Report on Collaborative Study of Spectrophotometric Method of Analysis of Triple Superphosphate"—W. M. Hoffman, USDA.
"Relation of the State Regulatory Office of the Local Fertilizer Industry"—Bruce Poundstone, Kentucky State Chemist.
"Are We Willing to Pay the Piper?"—John A. Brabson, director, Chemical Development, TVA Research Branch.
"Intermittent or Continuous Shaking in the Procedure for the Determination of Insoluble P_2O_5."—H. L. Marshall, Olin Mathieson Chemical Corp. discussion leader.
"Resume of Results of NPFI Chemical Control Project"—Dr. Sauchelli.
Miscellaneous Items: Open Discussion.

1. Importance of accurate determination of free acid in superphosphate vis-a-vis ammoniation.
2. Desirability of dependable quick method for direct determination of available P_2O_5.
3. Use of a coding system in the production of bagging and shipment of fertilizers.
4. Procedure in sampling in AOAC. Sec. 2.1.
5. Sampling for production control.
6. Solutions analysis particularly for total nitrogen.
7. Fertilizer analysis for ammoniacal nitrogen.
8. The value of determining urea in mixed fertilizers.

FERTILIZER TECHNOLOGY SCHOOL FOR FARM ADVISORS

On Sept. 16, a two-day Farm Advisors Fertilizer Technology School opens at Giannini Hall on the Berkeley campus. It is jointly sponsored by the National Plant Food Institute and the Agricultural Extension Service of the University of California.

The agenda was planned by Dr. Richard Bahme, NPFI western regional director, and Dr. W. E. Martin, extension soils specialist of the Agricultural Extension Service at the University.



Prof. Skuli Rutford, director of agricultural extension, Univ. of Minnesota, and Dr. W. P. Martin, head of the Soils Dept., receive a $2,000 check from the National Plant Food Institute to help support 1958 pasture fertilization demonstrations in Southeast and Northern Minn. Presentation was made by Z. H. Beers, NPFI midwest director.

CALENDAR

Sept. 9-12. National Chemical Exposition, sponsored by Chicago Section, American Chemical Society, International Amphitheatre, Chicago.
Sept. 15-19. Instrument-Automation Conference and Exhibit, Philadelphia, Pa.
Sept. 16-17. Farm Advisors Fertilizer Technology School, sponsored by National Plant Food Institute and Agr. Extension Service, Univ. of California, Giannini Hall, Berkeley campus.
Sept. 15-17. Canadian Agricultural Chemicals Association annual meeting and conference, Fort Garry Hotel, Winnipeg, Canada.
Sept. 24. New England Fertilizer Conference, Melvin Village, N. H.
Sept. 25. Chemical Industry Safety Workshop, Shamrock Hilton Hotel, Houston, Tex. Sponsored by Manufacturing Chemists' Assn.
Oct. 13. Agricultural Research Institute panel on problems related to agriculture in the fertilizer producing industry, Academy of Sciences Bldg., Washington, D. C.
Oct. 14-15. Western Agricultural Chemicals Assn. annual meeting, Villa Hotel, San Mateo, Calif.
Oct. 16. National Plant Food Institute conference on chemical control problems, Shoreham Hotel, Washington, D. C.
Oct. 17. Assn. of American Fertilizer Control Officials annual meeting, Shoreham Hotel, Washington, D. C.
Oct. 20. Sales clinic of Salesmen's Association of the American Chemical Industry, Roosevelt Hotel, New York City.
Oct. 20-21. Fertilizer Section, National Safety Council annual fall meeting, LaSalle Hotel, Chicago.
Oct. 22-24. Pacific N. W. Plant Food Assn. annual meeting, Gearhart, Ore.
Oct. 27. Western Range Fertilization Conference sponsored by National Plant Food Institute and Soil Improvement Committee, California Fertilizer Association, Riverview Country Club, Redding, Calif.
Oct. 28. Assn. of Consulting Chemists & Chemical Engineers annual meeting, Biltmore Hotel, New York City.
Oct. 28-29. Northwest Garden Supply Trade Show, Masonic Temple, Portland, Ore.
Oct. 29-31. 25th annual meeting, National Agricultural Chemicals Assn., General Oglethorpe Hotel, Savannah, Ga.
Oct. 30. Southeastern Soil Fertility conference, Atlanta Biltmore Hotel, Atlanta, Ga.
Nov. 4-6. Canadian National Packaging Exposition sponsored by Packaging Assn. of Canada, Automotive Bldg., Exhibition Grounds, Toronto, Ont.
Nov. 5-7. Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.
Nov. 9-11. Calif. Fertilizer Association 35th annual convention, Ambassador Hotel, Los Angeles.
Nov. 10-11. Agricultural Aviation Research conference, Milwaukee.
Nov. 16-18. National Fertilizer Solutions Assn. Convention, Netherland Hilton Hotel, Cincinnati.
Nov. 19-20. Carolinas-Virginia Pesticide Formulators Assn. annual meeting, Carolina Hotel, Pinehurst, N. C.
Nov. 24-25. Eastern Branch, Entomological Society of America annual meeting, Lord Baltimore Hotel, Baltimore, Md.
Dec. 1-4. Annual meeting of Entomological Society of America, Hotel Utah, Salt Lake City.
Dec. 3-4. North Central Weed Control conference, Netherland Hilton Hotel, Cincinnati, O.
Dec. 3-5. Agricultural Ammonia Institute annual meeting, Morrison Hotel, Chicago.
Dec. 9-11. Annual meeting of Chemical Specialties Mfrs. Assn., Commodore Hotel, New York City.
Dec. 17-18. Beltwide Cotton Production Conf., sponsored by National Cotton Council, Rice Hotel, Houston, Tex.

ARI PANEL TO DISCUSS FERTILIZER

Fertilizer industry problems that are related to agriculture will be discussed by a panel of three top men next month.

The Agricultural Research Institute (ARI) is sponsoring the panel discussion at its National Academy of Sciences headquarters in Washington, D. C. on October 13. The meeting, which is open, promises to be interesting and rewarding to all persons connected with the fertilizer industry.

Panelists and their topics are:

- Dr. M. B. Gillis, director of research, International Minerals and Chemical Corporation—*Technical Problems in the Fertilizer Industry.*
- Dr. E. D. Crittenden, consultant, Allied Chemical Corporation—*Problems in the Industry Related to Research and Recommendations by the Agricultural Experiment Stations.*
- Edwin Cox, chemical engineer, formerly with Virginia-Carolina Chemical Corporation—*Business Problems in the Fertilizer Industry.*

Moderator for the panel is Dr. Vincent Sauchelli, Chemical Technologist of the National Plant Food Institute.

The ARI is an organization affiliated with the Agricultural Board, a unit of the National Research Council. It is made up of:

1. Corporations and individuals engaged in all the various phases of agricultural services: in production, processing and marketing of agricultural products; in manufacture of materials and equipment used in the production, processing and transportation of farm products.

2. State and federal research organizations, academic institutions, scientific societies and other groups related to the science of agriculture. At present many fertilizer manufacturers and mixers are members. However, the representation is inadequate considering the importance of the fertilizer industry in the national economy. This may be due largely to the fact that the ARI has not sufficiently publicized its activities.

The National Research Council was organized by the National Academy of Sciences in 1916 at the request of President Woodrow Wilson as a measure of national preparedness. The Academy was created in 1863 by an act of Congress during Lincoln's administration. It was designed to be a non-profit unit, free and independent of pressures from political or vested interests and hence available to government agencies as a source of unbiased, objective advice on scientific matters. Through its boards and committees it can call on the entire scientific potential of the United States without cost except for traveling expenses. The council is made up of eight main divisions among which of interest to farm chemicals people are the Division of Biology and Agriculture and the Division of Chemistry and Chemical Technology.

The Agricultural Board

These divisions carry on their work through permanent boards and institutes and for special projects through committees, subcommittees and panels. One of these is the Agricultural Board, established in 1944 to advance and interpret scientific knowledge pertaining to agriculture and initiate and provide recommendations relative to agriculture based on objective analysis and to publicize technical and other pertinent information.

Current active committees are studying problems in agricultural equipment, agricultural pests, animal breeding, animal health, range and pasture management, soil and water conservation, soil-crop-water relationships, plant composition and fertilizer needs, and economics of fertilizer use.

Neither the council nor the Agricultural Board is a government agency. Its composition and that of its committees are not limited to personnel of the U. S. Department of Agriculture and land-grant colleges but it is free to call on all these and eminent scientists from all sources—including industry. It does not have its own facilities and personnel for conducting research but it can stimulate research in various fields by pointing out the problems and possible methods of approach.

Why ARI Was Established

The Agricultural Research Institute was established in 1951 and is the conception of industrial scientists who believed it would be a supporting organization for the Agricultural Board in the promotion of research and policies necessary to the best manner of utilizing the nation's agricultural resources. Since its inception the ARI has justified the hopes of its sponsors that it would be a medium for organizing the talents of scientists in industry, public agencies, scientific societies and private institutions to aid the Board in its work and to provide a meeting place where the discussions of common problems could proceed without restrictions.

What the ARI stands for can best be expressed by the following quotation from a talk by Dr. S. Douglas Cornell, of the National Academy of Sciences:

"The ARI and Agricultural Board embody in a very real and meaningful fashion advantages which cannot be found in quite the same way in any other place. The broad range of membership provides opportunity for people from those three sources—industry, government and academic life—to come together in the interests of a broad field of science. This is something that can be done effectively in the Academy-Research Council, outside the confines of government, without the pressures that often exist within the government or even within industry and universities.

"The fact that you number in your membership some 75 industrial organizations, institutes and research associations, some 24 scientific societies, 5 of the great government agencies and some 44 of the state agricultural experiment stations is ample evidence that you effectively combine these great aspects of American life in an effort to find out what is best and carry out what is best for the development of agriculture in this country."

NEW USES ACCEPTED FOR MYLONE SOIL FUMIGANT

USDA has accepted labeling for Mylone covering applications on any kind of vegetable seed bed, ornamental propagating bed, turf preplanting bed or forest tree seed bed, according to Union Carbide Chemicals Co.

Mylone soil fumigant, formulation grade, is supplied by Carbide to manufacturers who formulate their own branded soil fumigant products, based on Mylone, for sale to growers.

Carbide points out that like most soil fumigants, Mylone must be allowed time to dissipate before seeding or planting so it will not affect the plants. A three-week waiting period is normally sufficient.

MESQUITE CONTROLLED BY 2,4,5-T IN ARIZONA

Velvet mesquite, the grass-destroying weed tree, can be controlled in Arizona, according to USDA range conservationists. This is important because as few as 25 mature trees to the acre will reduce perennial grass yield by 50 per cent.

Aerial spraying of 2,4,5-T in the spring when leaves are full-sized, but still succulent, and flower development is complete, will give sufficient mesquite kill to make grass reseeding profitable. Single trees or light stands of mesquite are easily controlled by spraying diesel oil around the base of the tree. This practice costs about 5 cents a tree, however, so it becomes expensive in dense stands.

In southern Arizona, mesquite must be treated in two consecutive years to achieve 50 per cent kill, USDA said. Aerial spraying the first year only defoliates the trees. They come back rapidly and the following spring must be retreated. Plants remaining after the second treatment recover very slowly, and a third treatment is not necessary for about five years.

Fred H. Tschirley, USDA range conservationist, reports that consecutive-year treatments of 2,4,5-T applied at the rate of a half-pound per acre in a mixture of 1 gallon diesel oil and 4 gallons of water result in 50 per cent kill. He noticed that native grasses bounce back rapidly when mesquite is brought under control.

In addition to their work with 2,4,5-T, the experimenters are testing new herbicides and combinations of herbicides and carriers to see if they can find a herbicide that will give better control of mesquite.

MINES BUREAU TESTS NEW PHOSPHATE-ROCK PLANER

A new model of a phosphate-rock planer, designed by the Bureau of Mines, will be tested in an underground phosphate mine in Utah during the 1959 fiscal year. This, says the Bureau, is part of a program to increase recovery of this commodity through mining and metallurgical research. Beneficiation methods for both western and southeastern phosphate rock also will be studied.

Other equipment is being designed by the Bureau to aid in developing underground low-cost mass-mining techniques, including a mechanical timbering jumbo to handle yielding steel ground props and remote controls for the phosphate-rock planer.

Large tonnages of phosphate rock in the western field now are bypassed because they cannot be upgraded by present methods. Research has been started at the Bureau's Albany, Ore., station in an effort to develop beneficiation techniques applicable to the rock beds not being utilized.

At the Tuscaloosa, Ala., station, the Bureau is continuing investigations to determine the chemical and physical nature of Florida and Tennessee phosphate slimes and develop a possible process for using such material. Now, these slow-settling slimes, which contain nearly as much phosphate as the original ore, are wasted. The 10 million tons discarded annually requires large acreages of high-value land for storage.

FERTILE SOILS OFTEN CAN USE EXTRA FOOD

Last year, University of Minnesota soils scientists experimented with land that produced 138 bushels of corn without fertilizer.

On another part of the field, where the researchers used 80 pounds of nitrogen and 80 pounds of phosphate per acre, yields were boosted to 159 bushels per acre. The 21-bushel yield increase was worth $25 and the fertilizer cost $12. Net gain in profit: $13 per acre.

The tests were conducted at the Southern Experiment Station, Waseca, Minn., by A. C. Caldwell, soils scientist, and John Thompson, station agronomist. The land was in corn for the second year in a row, but had been in permanent pasture for about 25 years before being plowed in Fall, 1955.

TWO 2,4-D TREATMENTS KILL 95% OF CATTAILS

One application of 2,4-D in the spring and another in the fall has been found to be 95 per cent effective in killing cattails, according to Extension agronomists at the University of Idaho. And, they say, similar treatments the second year usually result in complete control.

Recommended solution is 4 pounds heavy ester 2,4-D, 10 gallons of diesel oil, 1 pint of emulsifier and 300 to 400 gallons of water per acre. Water is added after the first three ingredients are mixed.

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NAC WILL SEEK AMENDMENT TO END TOLERANCE FEES

"The Notice by the Federal Food and Drug Administration, published in the Federal Register for August 7th., announcing an increase in fees for the establishment of tolerances under the Miller Pesticide Amendment to the Federal Food, Drug, and Cosmetic Act, is causing much adverse comment by the members of the Pesticide Industry." This was the statement by Lea S. Hitchner, executive secretary of the National Agricultural Chemicals Association, the day after the fee increase was announced.

"Industry's position on the matter at the time the Amendment was pending in Congress, and unchanged to date, is that this law is for the protection of the public and not for the benefit of those requesting residue tolerances or exemptions," Mr. Hitchner continued. "Accordingly, the Industry feels that the costs of the administration of the law by the Food and Drug Administration should be a regular part of their operational expenses."

Mr. Hitchner remarked that it was the announced Administration policy at the time the Amendment was pending, that, as far as practicable, all government services were to be self-supporting through the collection of fees, and it was on this basis that the fee provision was inserted into the legislation. Such a government-wide program has not been put into effect. Proposed legislation introduced last year by the Food and Drug Administration, covering chemicals used in or on food, provides for no comparable fee system to cover administration of the law.

"In view of the above and due to the fact that Industry looks upon these fees as an additional 'tax on doing business'," Hitchner concluded, "The National Agricultural Chemicals Association, as spokesman for the Pesticide Industry, proposes to seek an amendment to the law which would eliminate fees charged for the establishment of a tolerance."

ICA AUTHORIZATIONS

Korea. $3,000,000—nitrogenous fertilizer (PA 89-230-99-H9-8023). Contract period: June 30 to Nov. 30, 1958. Source: World wide. Terminal delivery date: Dec. 31, 1958.

$512,000—nitrogenous fertilizer (PA 89-230-99-H9-8023). Contract period: June 30 to Oct. 31, 1958. Source: World wide. Terminal delivery date: Dec. 31, 1958.

Vietnam. $300,000 and $225,000—nitrogenous fertilizer (PA's 30-230-99-70-8044 and 8043, respectively). Contract period: June 30 to Dec. 31, 1958. Source: World wide. Terminal delivery date: Feb. 28, 1959.

Barter provision applies on all the above authorizations.

SOVIET TECHNICAL DATA AVAILABLE FROM USDC

A Foreign Technical Information Center now is operating in the U. S. Dept. of Commerce to provide American science and industry with access to translations of a large amount of Soviet technical information.

The Center is a part of the Office of Technical Services, Business and Defense Services Administration. John C. Green is director of OTS.

Services of the Center include publication of abstracts of all articles appearing in 141 Soviet technical journals, translations of important sections of *Referativnvy Zhurnal* (the Russians' own abstract journal), and a semi-monthly review of various areas of Soviet science compiled by the Central Intelligence Agency. Abstracts of each issue of the 141 journals may be purchased from OTS on a subscription or single issue basis, as may CIA's *Scientific Information Report.*

OTS will soon begin distributing complete translations of articles and books, Director Green said. Translations will be listed in an abstract journal to begin publication about September.

Translated sections of the biology, chemistry and physics series of *Referativnvy Zhurnal* are available. Write to OTS, U. S. Department of Commerce, Washington 25, D. C. for a monthly price list.

SULFUR, SULFURIC ACID OUTPUT BELOW LAST YEAR

Domestic Frasch sulfur output has been running more than 5 per cent below last year's level, the U. S. Department of Commerce reported in the June *Chemical and Rubber Industry Report.* Producers seem to have adjusted production to meet current domestic and export sales, so that large additional stocks are not likely to accumulate as in the past 18 months.

Output of recovered sulfur has been running about 20 per cent ahead of the like period of 1957, the Dept. said, and if this rate continues, total annual production will exceed 600,000 long tons.

Currently, sulfuric acid production and consumption are believed to be about 5 per cent below those for the same period of 1957.

LIME IN 1957

Total lime production in 1957 was 10¼ million tons, according to reports of producers to the Bureau of Mines, U. S. Dept. of Interior. This was a 3 per cent decline from the record of more than 10½ million tons in 1956 and 2 per cent below 1955, the second highest year.

Lime sold or used in agriculture in 1957 totaled 208,600 tons, compared with 252,035 tons in 1956.

Production—May, 1958

Compiled from Government Sources

Chemical	Unit	May 1958	May 1957	April 1958
Ammonia, Synth. (anhydrous)	s. tons	[1]348,158	334,209	329,837
Ammonia, byproduct liquor (NH_3 content)	s. tons	1,066	1,485	1,141
Ammoniating solutions (incl. urea ammoniating sol.) 100% N	s. tons	62,092	———	82,337
Ammonium nitrate, fert. grade (100% NH_4NO_3)	s. tons	167,122	203,062	208,512
Ammonium sulfate				
synthetic (technical)	s. tons	[2]104,410	101,006	97,603
byproduct	s. tons	49,198	83,298	48,793
BHC (Hexachlorocyclohexane)	pounds	5,245,581	4,572,140	3,481,420
Gamma content	pounds	831,446	707,054	602,941
Copper sulfate (gross)	s. tons	4,912	7,628	4,304
DDT	pounds	12,184,886	12,880,479	11,351,113
2,4-D acid	pounds	2,272,995	2,780,878	3,703,124
esters and salts	pounds	3,060,422	2,589,358	4,905,771
esters and salts (acid equiv.)	pounds	2,267,298	2,018,931	3,685,001
Phosphoric acid (100% P_2O_5)	s. tons	153,199	138,813	157,076
Sulfur, native (Frasch)	l. tons	400,957	429,227	402,581
recovered	l. tons	63,737	42,400	46,195
Sulfuric acid, gross (100% H_2SO_4)	s. tons	1,309,774	1,429,965	1,296,892
Superphosphate and other phos. materials (100% APA)	s. tons	232,495	213,406	*241,668
normal and enriched (100% APA)	s. tons	126,838	123,565	*139,265
concentrated (100% APA)	s. tons	78,093	68,052	72,505
Ammonium phosphates (100% APA)	s. tons	15,128	14,867	*15,964
other phos. ferts. (incl. wet-base goods) (100% APA)	s. tons	12,436	6,922	13,934
2,4,5-T acid	pounds	506,899	589,044	336,083
Urea (total primary production)	pounds	90,497,304	76,563,212	88,413,356

*Revised. [1]Includes quantities for 2 plants previously not reporting. [2]Includes quantities for 1 plant previously not reporting.

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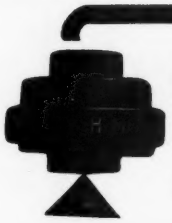
MONARCH SPRAYS



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CATALOG I

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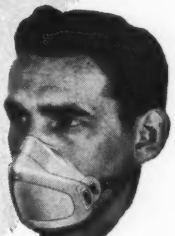

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FARM CHEMICALS
Equipment & Supplies

TRIAL RENTAL PROGRAM FOR HANDLING EQUIPMENT

Tote System, Inc., manufacturers of bulk materials handling equipment, now has a "Trial Rental Program" for Tote Bins and Tilts.

Under the program, standard aluminum Tote Bins in stock sizes and Tote Tilts, which are discharge mechanisms for the bins, are available for trial periods, on a rental basis instead of sale.

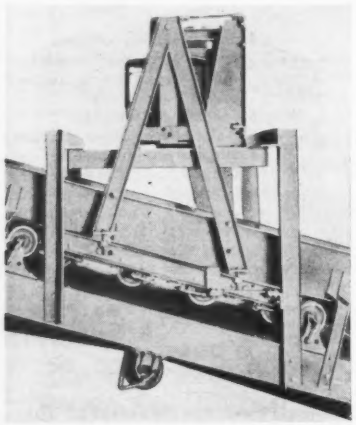
Complete information on the rental program is available. Just

CIRCLE 248 ON SERVICE CARD

BELT CONVEYOR SCALE FOR EXISTING CONVEYORS

Weighing & Control Components, Inc. reports development of a unitized, pneumatic belt conveyor scale which can be installed on existing flat-belt or trough-type conveyors with a minimum of downtime and only slight modification to the conveyor. The unit can be adapted to either fixed or variable speed conveyors.

The W-C belt conveyor scale is available in a variety of sizes to handle a large range of capacities. It uses no knife edges, pivots or bearings, but instead employs a flexural frame arrangement which is said to eliminate all effects of side thrust and eccentric loading on the conveyor, delivering a single component of force.

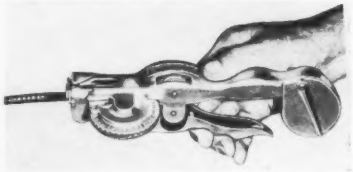


Used with other W-C unitized weighing components, the scale can perform many functions: Rate of flow of material in terms of weight can be indicated, recorded, totalized, proportioned or programmed.

For full information,

CIRCLE 249 ON SERVICE CARD

HAND LABELER MAKES LABELS "ON THE SPOT"



A portable hand embosser, named the "Midgie" Labeler, makes individual label strips in any desired length, according to its manufacturer, Roovers-Lotsch Corp.

The device embosses clearly marked permanent raised character lettering and numbers on strips of corrosion-resistant monel, stainless steel, aluminum, copper, lead and vinyl plastic.

Only 10½ inches long, the labeler is operated by dialing the letter and squeezing the handle. For details,

CIRCLE 250 ON SERVICE CARD

AUTOMATED LAB FOR ANALYTICAL WORK

An automated chemistry lab will free scientists from routine analytical work, says its U. S. distributor, Chicago Apparatus Co. in the *Industrial Research Newsletter*, published by Armour Research Foundation.

The Analmatic instrument system is built by Britain's Baird and Tatlock Ltd. It will collect samples; mix and meter reagents and samples; heat and agitate solutions; run tests (color, titration, potentiometric, etc.); make graph of results; wash all equipment; and sound alarm for bad samples or make automatic corrections in process. Priced at $15,000 to $50,000 a year, it is claimed to save about $45,000 annually in salaries.

DRUM COVER ELIMINATES DUSTING, MATERIAL LOSS

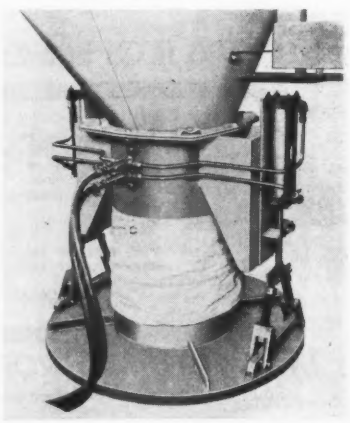
A new air-operated, swivel-mounted drum cover for use with Richardson automatic scales prevents dusting and material losses while filling containers with chemicals, salts and other dry powders, Richardson Scale Co. says.

Consisting of a metal circular drum cover connected to the spout of an automatic scale by a flexible boot seal, the new unit descends through a 6-in. vertical travel to cover and seal off tops of containers. Air cylinders hold the cover securely in position and maximum flexibility and speed is provided by either a swivel-mounted or straight spout, Richardson claims.

Operation is said to be automatic and foolproof. A floor switch actuates the drum cover and when it is in sealed position over the container, the scale discharges automatically through the boot seal. Workers are safeguarded against the escape of noxious or injurious dust and material losses are eliminated.

For additional information on the new drum cover,

CIRCLE 251 ON SERVICE CARD



POLYETHYLENE BAGS FROM CHIPPEWA PLASTICS, INC.

Chippewa Plastics, Inc. reports it is now in full scale production of 10 mil polyethylene bags. They are said to be waterproof, transparent, chemical-resistant and non-toxic, light in weight, reusable and weather resistant.

Toughness of the bag was tested by Chippewa. Bags filled with seed corn were dropped from the top of a warehouse onto a concrete floor repeatedly without fracturing the bag, the company claims. They are manufactured from Monsanto Chemical Co's polyethylene 706.

The bags are available in 18" to 30" widths, and 26" to 60" lengths, printed one to four colors. Open mouth or valve type polyethylene bags can be supplied. For details,

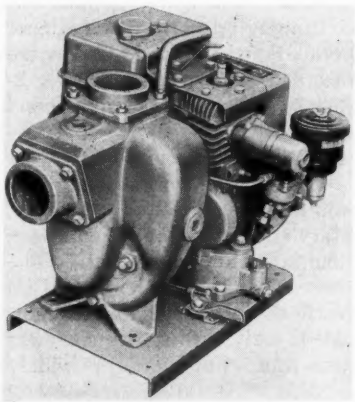
CIRCLE 252 ON SERVICE CARD

PUMP RESISTS CORROSIVE EFFECTS OF LIQUID FERTS.

Recommended for transferring or spraying liquid fertilizers, the Flomax 8 centrifugal pump's all-iron construction permits it to withstand corrosive effects of liquid plant foods, reports its manufacturer, Marine Products Co.

In field tests conducted over several seasons, some of the pumps were used exclusively for filling tank trucks from supply cars discharging trucks into the field spraying units. Others were used to supply pressure for spraying crops directly from the tank truck.

Flomax Model 8 is self-contained with its own gasoline engine. It requires no power take-off connection. When used with a tank truck already equipped with a spraying boom, the pump is usually fastened to the bed of the truck alongside the tank. Flow from the pump is through a flexible hose to the spraying boom. The same pump is sometimes employed for filling the tank truck also, if gravity flow from the transport cars is not feasible.



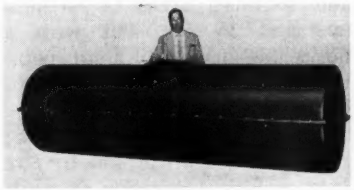
More information is available.

CIRCLE 253 ON SERVICE CARD

HANSON FIBERGLASS TANKS HOLD UP TO 5,000 GALLONS

Designed specifically to hold chemicals and liquid fertilizer, new Hanson Equipment Co. seamless tanks are available in 50 to 5,000 gallon capacity. The manufacturer says they won't rot, rust or corrode. Light fiberglass makes handling and storage easy.

Hanson will send you more



information on its new tanks if you

CIRCLE 254 ON SERVICE CARD

LINED PAILS SOLVE CORROSION PROBLEM

A pesticide manufacturer's problem has been solved by changing the specifications of the lined steel pails and drums used in shipping its products, reports Jones and Laughlin Steel Corp.

Niagara Chemical Div. of Food Machinery & Chemical Corp. had been troubled with leakage and contamination of products at its Middleport, N. Y. plant due to corrosion in the steel shipping containers. The chemicals shipped are principally chlorinated materials in an organic solvent with an emulsifying agent.

Solution of the container problem is attributed by J&L to three principal factors: First, the change to a phenolic lining material because it is impervious to acids; second, the physical characteristics of the linings; and third, modern mechanized handling methods.

Tests of J&L containers conducted by Niagara Chemical engineers have proved that the linings separate product and steel far beyond the required time, according to Jones & Laughlin. They'll be glad to furnish you with more information on their lined pails if you

CIRCLE 255 ON SERVICE CARD

FOR SALE: Nearly new, 3 scale, stainless steel, open mouth Bemis bagger and "V" bag conveyor. C. ROY CURTIS & SON, INC., Marion, N. Y.

SALE: Horizontal Aluminum Tanks 4,000, 7,000 gallons. Steam Tube Dryers (Tubes Removable) 6′ x 50′, 6′ x 30′, 4′ x 30′. Ribbon Mixers 336, 200, 75 cubic foot working capacity. Also Hammermills, Dewatering Presses, Conveyor, etc. PERRY, 1430 N. 6th St., Philadelphia 22, Pa.

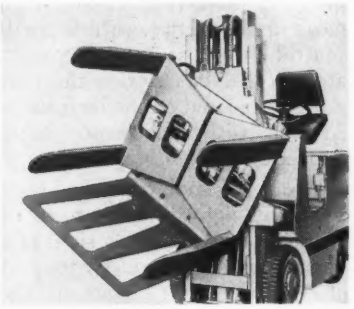
LIFT TRUCK ATTACHMENT INVERTS CONTAINERS

A lift truck attachment designed to invert containers of liquid in storage to prevent "settling out" has been developed by Yale Materials Handling Div., Yale & Towne Mfg. Co.

The attachment uses two pairs of hydraulically operated forks, the lower pair fitting into the pallet on which the containers are stored and the upper pair bringing an empty pallet down on the top of the load to hold it securely in place. The attachment rotates 180 degrees to position it upside down on the second pallet. The pallet formerly on the floor is removed by raising the upper set of forks.

For details,

CIRCLE 256 ON SERVICE CARD



PEST REPORTS

Presented in cooperation with the Economic Insect Survey Section, Plant Pest Control Branch, Agricultural Research Service. USDA.

BOLLWORM SERIOUS IN SOME AREAS

THE bollworm by late July was causing more concern than any other cotton insect in several areas. This insect caused heavy damage to several fields in Scotland and Anson Counties of North Carolina, while in South Carolina it was regarded as the number-one cotton pest in most of the state. In South Carolina damage was statewide with 35–50 per cent of squares and young bolls being damaged in fields where controls were not applied at three-day intervals. The infestation in Georgia was considered to be the worst on record in that state. In fields checked in middle and southern areas during the last week of July eggs averaged 15 and larvae averaged 8 per 100 terminals.

Bollworm counts in Alabama remained fairly constant with slightly lighter populations in the northern part of the state. Mississippi recorded some square injury, but no general egg deposition was reported from the delta section. Predator control was important in Tennessee. Bollworm populations were heavier in fields treated for boll weevil when insecticides were not added for bollworms. Light populations of the bollworm were reported from Louisiana, Arkansas, Missouri and Oklahoma. It was named the principal problem in Texas cotton particularly in the central, north central, east and northeastern areas. In New Mexico the pest was spotted and on the increase in Arizona with treatments being applied in some fields.

The boll weevil, which had been relatively light through most of the season, was showing signs of a build up in some areas by the end of July. Activity was on the increase in Texas with heavy damage noted in some untreated fields. An increase was reported from older cotton of Louisiana with light first-brood populations appearing in late-planted cotton. Counts were fairly light in Missouri, Arkansas and Mississippi.

A noticeable increase was reported from Alabama and a serious problem was expected if the favorable weather continued. Square infestation in the middle and southern areas of Georgia averaged 35 per cent with a noticeable increase of first generation being reported from south Georgia.

Boll weevils were increasing rapidly in South Carolina by late July. First-generation weevils were ovipositing freely. Square infestations were as high as 75 per cent in the Florence area. However, where proper controls were applied in the Darlington area an infestation of less than one per cent was found in 82 fields checked. In scattered locations in the same area, infestations up to 18 per cent were found, with counts going up to 70 per cent in untreated fields of some counties. Although high populations of weevil were reported from some North Carolina fields the build-up was slow in the lower Piedmont area.

Aphids on cotton were rather light in most states. Damaging numbers were building up in some Georgia fields and treatments were needed in some delta area fields of Mississippi. Populations were on the increase in Arkansas, Tennessee and South Carolina where aphicides were not included with insecticide applications.

Spider mites during the latter part of July were heavy in localized areas of all states from Texas east and lygus bugs were on the increase in parts of New Mexico and Arizona.

An interesting note regarding cotton pests was the first report of the European corn borer being found in cotton stalks in Alabama. This had been reported from Arkansas earlier in the season and from Missouri and Tennessee in past seasons. Little, if any, economic damage has been noted from this pest in cotton.

CEREAL & FORAGE INSECTS

The large-scale cooperative rangeland, idleland and roadside grasshopper control programs were virtually over by the latter part of July but the insects were continuing to cause concern in other areas. In cooperative programs conducted in 10 states, approximately 4,500,000 acres were treated. The largest acreage was in Colorado where over 2,600,000 acres were treated. Texas with over 775,000 acres; Oklahoma 279,000; Kansas 210,000; Wyoming 195,000; New Mexico 148,000 and Arizona 138,000 accounted for the largest percentage of the remaining acreage treated under the federal-state-land owner cooperative program.

In late July, Alabama and Arkansas reported localized grasshopper problems. Nebraska, North and South Dakota, New Mexico, Utah and California also reported damaging populations continuing into late July. Higher populations than in 1957 were recorded in eastern and northeastern Oklahoma with second generation *Melanoplus* spp. observed in some localities.

The fall armyworm by late July was heavy in areas of Delaware, Maryland, Virginia, Tennessee, Louisiana and Arkansas. The true armyworm which failed to reach the serious potentials indicated early in the season was numerous, however, in widely

(Continued on page 60)

Patent Reviews

FC

By Dr. Melvin Nord

GRANULATION OF UREA-FORMALDEHYDE FERTILIZER COMPOSITION

U. S. 2,835,452, issued May 20, 1958 to William E. Cline, Merton M. De Lancey and Donald A. Engelbrecht, assigned to E. I. du Pont de Nemours & Co., describes a process for granulating urea-formaldehyde fertilizer compositions, in which the granule size is controlled.

Shown in Fig. 1 is a granulating and mixing mill 1 into which is fed filter cake from the filters 2. The moist mixture which is withdrawn from the mill 1 is conducted through a second granulating mill 3 which produces granules of various sizes. The granules thus formed are conducted to the screen 4 which may suitably be of six mesh.

The fines from the screen 4 continuously collect upon the weigh belt 5 which conducts the fines to the dryer 6. The dry product obtained from the dryer 6 is sent by means of an elevator 7 to the screens 8 and 9 which are of 10 and 20 mesh respectively, the oversize and undersize particles being collected in the bin 10.

Dry solids from the bin are conducted to the screw conveyor 11 which is equipped with a variable speed control 12. This conveyor feeds the crusher 13, which feeds the granulating-mixing mill 1. The coarse product which fails to pass through the screen 4 is transferred by means of the weigh belt 14 to the elevator 15, and thence to the crusher 13.

The weigh belts 5 and 14 control the electrical switch 16 which in turn controls the variable speed control 12 in such a way that if the product from the granulating mill 3 contains particles which are too high in moisture content and hence are made up largely of relatively large particles, the feed of dry solid will be increased by means of the variable control 12. The switch 16, is controlled by the respective loads carried by the moving weigh belts. This control is exerted in such fashion that if the load on 14 is in excess of the predetermined standard, the switch is engaged and the circuit, which actuates the motor driving the mechanism 12, is actuated.

Since this predetermined standard is dependent upon the load on 5, the effect is to control the recycling of dried solids by increasing the rate of recycling when the load on 14 relative to the load on 5 becomes excessive.

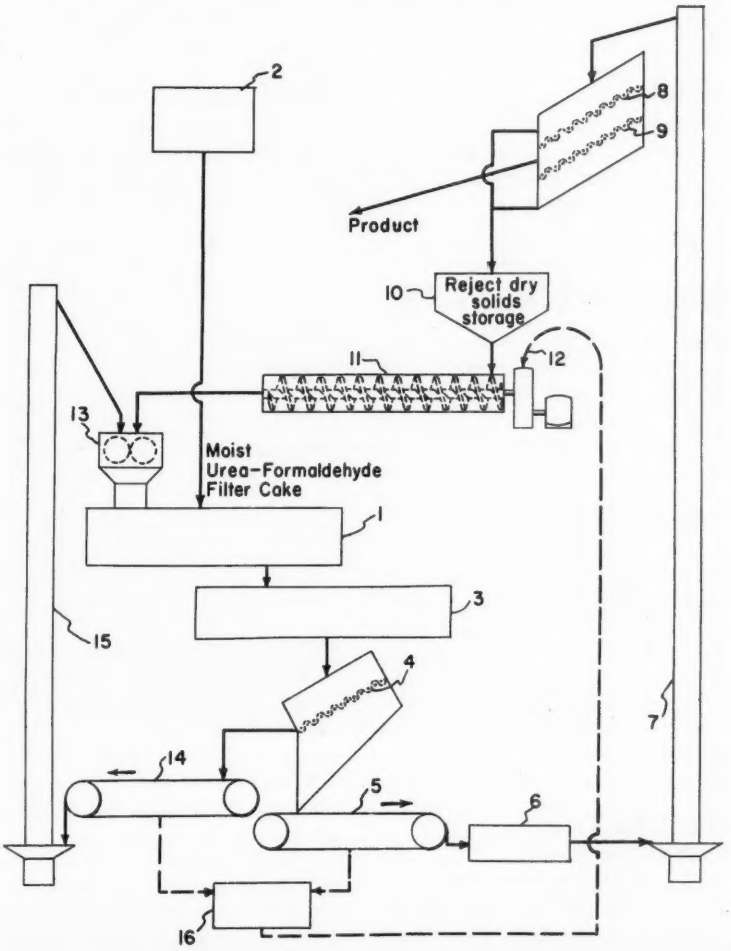
The net result of these operations is to control the respective feeds to the granulating-mixing mill 1 in such a manner as to produce a maximum amount of product of desired range of grain size from between screens 8 and 9.

FUMIGATING SOILS WITH NH_3

U.S. 2,830,887, issued April 15, 1958 to Frederick C. Bersworth, assigned to The Dow Chemical Co., relates to the application of certain polynitriles to soils to bring about conditions in which a controlled liberation of ammonia occurs for fumigation of those soils. The object is to permit the ammonia requirements of the soil to be satisfied without at the same time inducing the effects of copper toxicity in the plant.

An example of the method used in the invention is as follows: A composition consisting of a nitrogenous organic fertilizer, dried to remove moisture to a level below about 5 per cent, has incorporated in it 5 per cent of ethylenediamine tetraacetonitrile. It is then applied to the soil, in usual quantities as determined by the

(Continued on page 60)



scattered areas. New Jersey reported the pest present in considerable numbers and localized areas in Pennsylvania recorded damage. Both North and South Dakota had scattered armyworm damage while in Illinois and Wisconsin predators and parasites were instrumental in reducing populations.

Other cereal and forage insects active in late July include lygus bugs in Oregon, New Mexico, Utah, Colorado and Delaware and pea aphids in Maryland, Minnesota, Colorado, Utah and Idaho. The spotted alfalfa aphid has not caused concern this season but was on the increase in areas of New Mexico, Colorado and Oklahoma by late July.

PINK BOLLWORM FOUND IN ARIZONA COUNTY

During the first week of July a heavy infestation of the pink bollworm was reported in several cotton fields near Gila Bend, Maricopa County, Arizona. As of August 1, the known infested area approximated 7,000 acres. Following the initial find, plans were promptly formulated to inaugurate an eradication program. Cooperating in this effort are the Plant Pest Control Division, USDA, the State Commission of Agriculture and Horticulture, the Cotton Producers Association and the cotton industry, primarily ginning and oil mill interests.

The eradication plan during the 1958 season calls for application of an effective insecticide at the rate of 2 pounds technical per acre at weekly intervals for the period when the bolls are susceptible to pink bollworm attack. The land will be completely cleared of stalks and boll residues destroyed, no volunteer cotton grown in 1959 and cotton planted in a designated period. Adequate insecticide applications are planned for the susceptible period in 1959 together with other precautions that may be deemed advisable. (Note: An extension of the area was reported August 7 with the finding of an infested field in the main plantings of cotton in the Buckeye section of Maricopa County. This field is on the outer periphery of a block of a little over 20,000 acres of cotton.)

OTHER INSECT ACTIVITY

Orchard mites were among the most troublesome fruit pests during late July. They were numerous in areas of Maryland, New York, New Jersey, Ohio, Indiana and New Mexico.

Aphids were a problem in some Massachusetts orchards and were building up in New York. These insects were heavy in Maryland but parasites were very effective.

The pear psylla was more abundant than usual in the Willamette Valley of Oregon and reports indicate control has been more difficult than in the past. At Wenatchee, Washington adults of the third generation were at the peak by the last of July.

Truck crop insects in general were not causing much trouble through July. The beet armyworm was medium on tomatoes in localized areas of California and heavy on sugar beets in areas of Colusa and Sacramento Counties. The Mexican bean beetle was reported as heavy in parts of Utah, Colorado, Alabama and Delaware and the Colorado potato beetle caused damage in Washington and Delaware.

Among the man and animal insects, mosquitoes were causing concern in Idaho, California, Utah, Missouri, Georgia and Delaware. Horseflies were a statewide problem in Virginia and fleas in the homes were on the increase in many states. ▲

fertilizer requirements; on this basis the amount of fertilizer used is about 1 pound per 10 square feet, so that about 2/10 pound per 10 square feet of the nitrile is applied to the soil.

ACARICIDAL COMPOSITION

U.S. 2,832,716, issued April 29, 1958 to Carroll C. Cassil and Jerome Yaffe, assigned to Food Machinery and Chemical Corp., discloses an acaricidal dust containing as the active ingredient beta chloroethyl beta (p-tertiary-butyl phenoxy) alpha - methyl ethyl sulfiite, stabilized with propylene glycol.

PALATABILITY OF VEGETABLE FOODS

U. S. 2,836,010, issued May 27, 1958 to Eli Seifter, assigned to Monsanto Chemical Co., provides a method for increasing the sweetness of various vegetables, particularly for animal use.

Saccharin or its sodium salt is introduced into the stems, leaves, fruit and roots of succulent tissues of growing plants by application to the soil. These substances are quite resistant to soil bacteria, and remain in the soil for a considerable period of time without decomposition or deterioration.

BENEFICIATION OF PHOSPHATE ORES

U. S. 2,832,469, issued April 29, 1958 to James E. Lawver and assigned to International Minerals & Chemical Corp., relates to the electrostatic beneficiation of phosphate ores.

The electrostatic beneficiation process as applied to Florida pebble phosphate ores consists of an ore feed washing operation, a drying operation, differential electrification of the particles prior to each passage through an electrostatic field, and subjection of the differentially electrified particles to the attractive and repulsive forces of a number of electrostatic fields through which the materials pass as freely falling bodies.

METHOD DESCRIBED FOR SOIL AMMONIATION

U. S. 2,833,640, issued May 6, 1958 to Frederick C. Bersworth and assigned to The Dow Chemical Co., describes a method for the ammoniation of soils.

A slow controlled release of ammonia in the soil is accomplished, without increasing the formation of copper ammonia complexes, by the use of certain polynitrile compounds, such as ethanol-ethylenediamine trimethylenenitrile.

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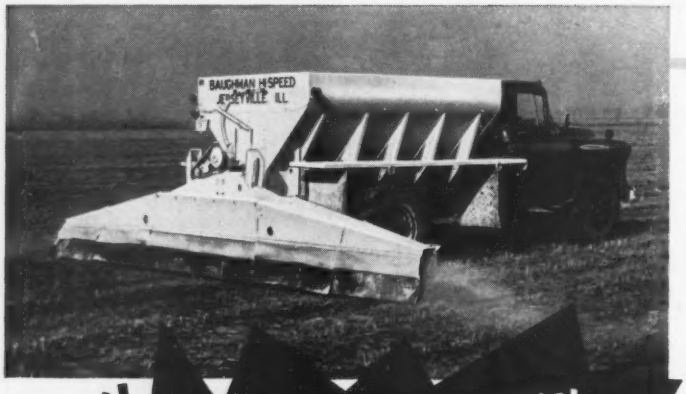

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American Agricultural Chemical Co., N. Y. C.
American Cyanamid Co., New York City
American Potash & Chemical Corp., Los Angeles, California
Ashcraft-Wilkinson Co., Atlanta, Ga.
Geigy Agr. Chems., Div. Geigy Chem. Corp. N. Y. C.
Velsicol Chemical Corp., Chicago, Ill.

IRON CHELATES
Geigy Agr. Chems., Div. Geigy Chem. Corp. N. Y. C.
Tennessee Corp., Atlanta, Ga.

IRON SULFATE
Tennessee Corp., Atlanta, Ga.

LEAD ARSENATE
American Agricultural Chemical Co., N. Y. C.

LIMESTONE
American Agricultural Chemical Co., N.Y.C.
Ashcraft-Wilkinson Co., Atlanta, Ga.

MACHINERY—Acid Making and Handling
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Acidulating
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Grinding and Pulverizing
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

Buyers' Guide

MACHINERY—Material Handling

Clark Equipt. Co., Construction Mach. Div., Benton Harbor, Mich.
Fulton Equipment Co., Atlanta, Ga.
Hough, The Frank G. Co., Libertyville. Ill.
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.
Tractomotive Corp., Deerfield, Ill.

MACHINERY—Mixing and Blending

Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Mixing, Screening and Bagging

Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Power Transmission

Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY
Superphosphate Manufacturing

Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MALATHION

American Cyanamid Co., New York City

MANGANESE SULFATE

Tennessee Corp., Atlanta, Ga.

MANURE SALTS

Potash Co. of America, Washington, D. C.

METHOXYCHLOR

Geigy Agr. Chems., Div. Geigy Chem. Corp. N.Y.C.

MINOR ELEMENTS

Geigy Agr. Chems., Div. Geigy Chem. Corp. N.Y.C.
Tennessee Corporation, Atlanta, Ga.

MIXERS

Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

NITRATE OF SODA

Allied Chemical Corp., Nitrogen Div., N.Y.C.
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Skokie, Ill
Woodward & Dickerson, Inc., Philadelphia, Pa.

NITROGEN SOLUTIONS

Allied Chemical Corp., Nitrogen Div., N. Y. C.
American Cyanamid Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
E. I. duPont de Nemours & Co., Wilmington, Del.
Escambia Chem. Corp., Pensacola, Fla.
Mississippi River Chem. Co., St. Louis, Mo.
Phillips Chemical Co., Bartlesville, Okla.
Sinclair Chemicals, Chicago, Ill.
Sohio Chemical Co., Lima, O.
The Texas Co., New York City

NITROGEN MATERIALS—Organic

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Skokie, Ill.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray

Monarch Mfg. Works, Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

PAILS—STEEL

Vulcan Containers, Inc., Bellwood, Ill.

PARATHION

American Cyanamid Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.

PHOSPHATE ROCK

American Agricultural Chemical Co., N. Y. C.
American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co, Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Skokie, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

PHOSPHORIC ACID

American Agricultural Chemical Co., N. Y. C.
Allied Chemical Corp., General Chemical Div., N. Y. C.

PLANT CONSTRUCTION—Fertilizer and Acid

Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

POTASH—Muriate

American Potash & Chemical Corp., Los Angeles, California
Ashcraft-Wilkinson Co., (Duval Potash) Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
Duval Sulphur & Potash Co., Houston, Tex.
International Min. & Chem. Corp., Skokie Ill.
Potash Co. of America, Washington, D. C.
Southwest Potash Corp., New York City
United States Potash Co., N. Y. C.

POTASH—Sulfate

American Potash & Chemical Corp., Los Angeles, California
International Min. & Chem. Corp., Skokie, Ill.
Potash Co. of America, Washington, D. C.

PRINTING PRESSES—Bag

Schmutz Mfg. Co., Louisville, Ky.

PYROPHYLLITE

Ashcraft-Wilkinson Co., Atlanta, Ga.

REPAIR PARTS AND CASTINGS

Stedman Foundry and Machine Co., Aurora, Ind.

RESPIRATORS

Flexo Products Inc., Westlake, Ohio

SCALES -Including Automatic Baggers

Stedman Foundry and Machine Co., Aurora, Ind.

SHOVEL LOADERS

Clark Equipt. Co., Benton Harbor, Mich.
Hough, The Frank G. Co., Libertyville, Ill.
Tractomotive Corp., Deerfield, Ill.

SLUDGE

H. J. Baker & Bro., New York City

SPRAYS

Baughman Mfg. Co., Jerseyville, Ill.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

SPREADERS—TRUCK

Baughman Manufacturing Co., Jerseyville, Ill.
Highway Equipment Co., Cedar Rapids, Iowa

SULFATE OF AMMONIA

Allied Chemical Corp., Nitrogen Div., N. Y. C.
American Agricultural Chemical Co., N. Y. C.
American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
Phillips Chemical Co., Bartlesville, Okla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFATE OF POTASH—MAGNESIA

International Min. & Chem. Corp., Skokie, Ill.

SULFUR

Ashcraft-Wilkinson Co., Atlanta, Ga.
Texas Gulf Sulphur Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFUR—Dusting & Spraying

Ashcraft-Wilkinson Co., Atlanta, Ga.
U.S. Phosphoric Products Div., Tennessee Corp., Tampa, Fla.

SULFURIC ACID

Allied Chemical Corp. General Chemical Div., N. Y. C.
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Skokie, Ill.
Tennessee Corp., Atlanta, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa. Fla.

SUPERPHOSPHATE

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Skokie, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SUPERPHOSPHATE—Concentrated

American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Skokie, Ill.
Phillips Chemical Co., Bartlesville, Okla.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TALC

Ashcraft-Wilkinson Co., Atlanta, Ga.

TANKAGE

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Skokie, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TOXAPHENE

Ashcraft-Wilkinson Co., Atlanta, Ga.

TRUCKS—SPREADER

Baughman Mfg. Co., Jerseyville, Ill.
Highway Equipment Co., Cedar Rapids, Iowa

UREA & UREA PRODUCTS

Allied Chemical Corp., Nitrogen Div., N. Y. C.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
E. I. duPont de Nemours & Co., Wilmington, Del.
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Sohio Chemical Co., Lima, O.

UREA-FORM

E. I. duPont de Nemours & Co., Wilmington, Del.

VALVES

Monarch Mfg. Works, Inc., Philadelphia, Pa.

ZINC SULFATE

Tennessee Corp., Atlanta, Ga.

Progress Report

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- SULPHUR
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